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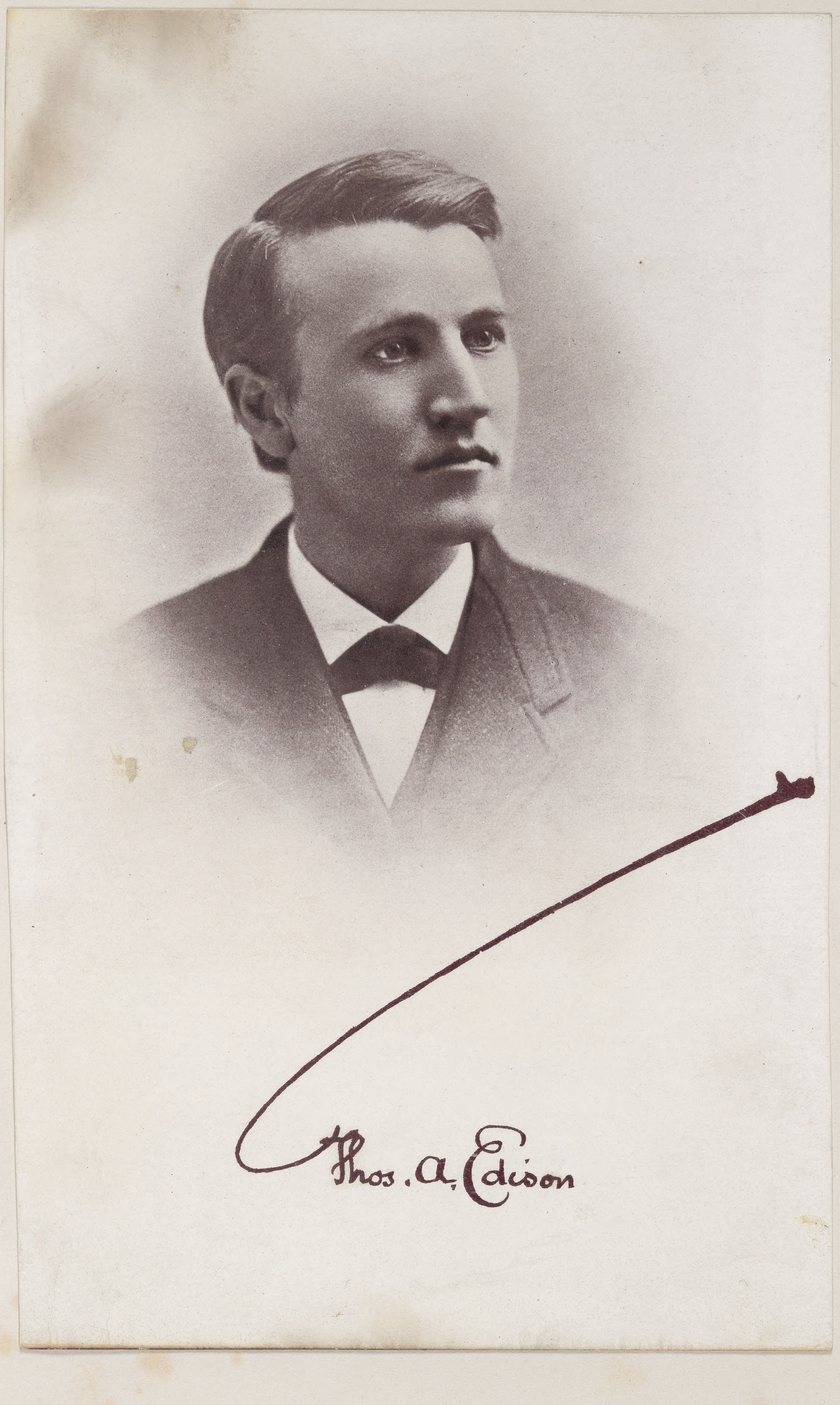
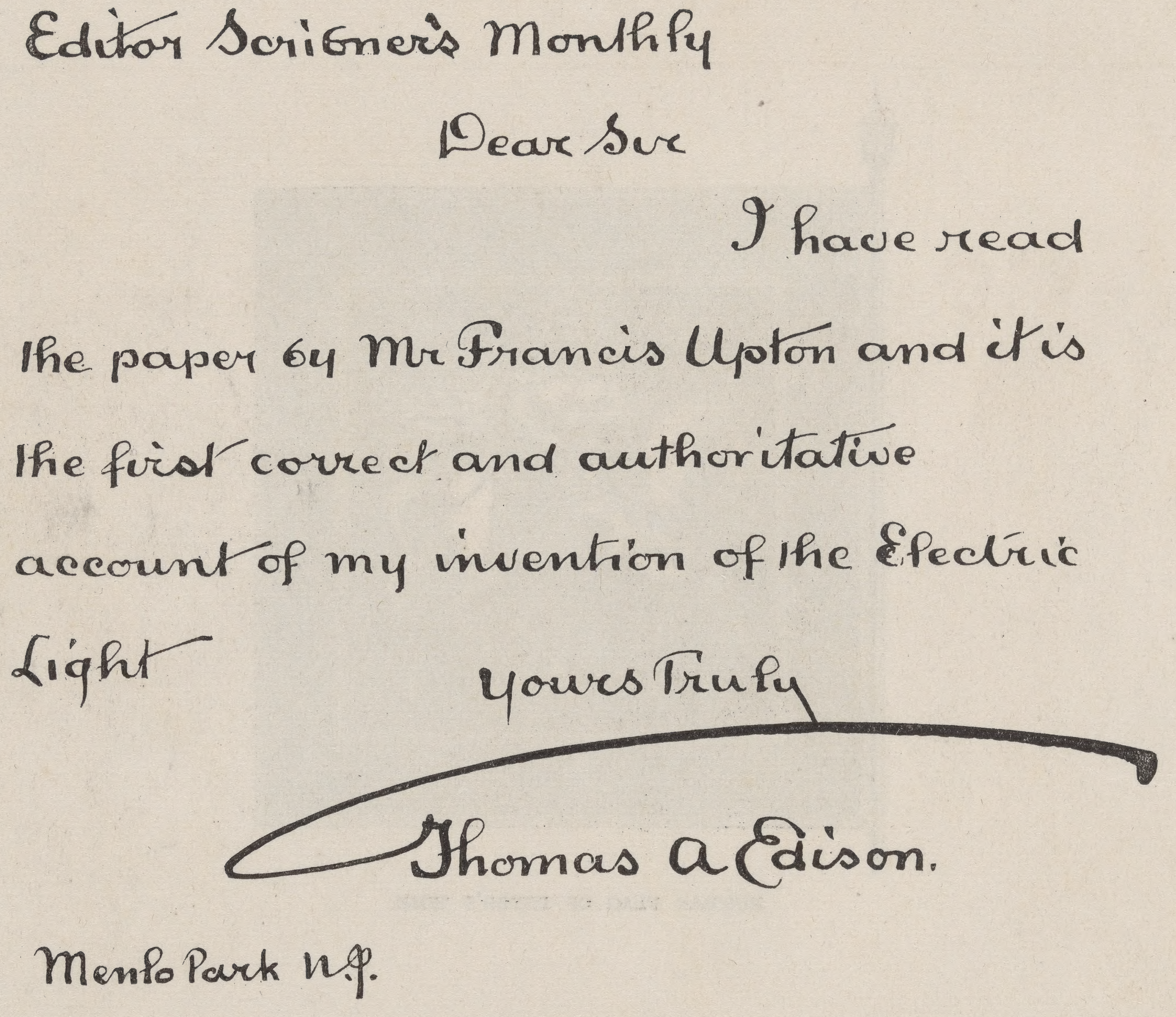


Thos. A. Edison



Editor Scribner's Monthly

Dear Sir

I have read the paper by Mr Francis Upton and it is the first correct and authoritative account of my invention of the Electric Light

Yours Truly

Thomas A Edison.

Menlo Park N.J.

[SEE PAGE 531.]

MSS 251B RB NMAH

T. A. EDISON,

Menlo Park, N. J., March 1 1880.

Dear Sir.

Thanks for the Photometer calculation, you are quite at liberty to dedicate any remarks you may be pleased to write on you visit here to

Yours Truly

Thomas A Edison.

Thos. A. Edison

DSI

CONTEMPORARY PORTRAITS.

NEW SERIES.—No. 23.

THOMAS ALVA EDISON.

All kinds of seership are rare. The possessor of the gift of vision which the Scotch call second-sight, and which penetrates into a hidden sea of subtle ether that seems to play mysteriously about life's path, is not an individual whom we meet every day. But still more difficult to meet with is a person endowed with what we will call first-sight, that is, with the gift of clear and penetrating vision into the actual life that rolls around us. The generality have lack-lustre eyes and see nothing beyond their own noses; a few take a lively interest in watching and sharing in anything bright, new, and original—these are souls not quite asleep. But they are very few indeed who are sufficiently awake to realise how marvellous a world this is in which we live; what huge sleeping powers lie within it, waiting only for the hand of man to rouse and direct their boundless activity.

Once, in "Essays and Reviews," a man who ought to have known better (Baden Powell) said that "the meaning of 'moral laws controlling physical' is not very clear." The meaning is this, that no degraded race is trusted with great powers. Were the leading races of the world to lose their orderliness and responsibility, with these qualities, we may be sure, would vanish their faculty of wielding the vast yet delicate mechanical powers to which they owe so much. Concurrently with the growth of civilisation these powers have developed. There were certain achievements of ancient civilisations which vanished with their decline and have never re-appeared. Everyone who will help to put his discoveries to wise uses can help the inventor to invent. The poet will not compose if there is no hope of a listening ear; the singer counts upon, almost lives upon, the sympathy of his audience; the representative man would be as badly off without the people as popular units would be helpless without representative, or, to use an American expression, pivotal men.

Strange as it may seem, Mr. Edison, a seer whose seership is held to Matter, has many of the characteristics ascribed to the seer of occult things. He reaches the acme of discovery very often in the dead of night; his face is not marked by the anxious gravity, the irremovable knots and furrows that mark laborious thought, but rather seems the face of one whose best things come by inspiration. Like the prophets of old, too, he is not of the world—wears shabby garments, does not care to be fêted, lives in his dreams. He might be a follower of the deity of the oracle, and say, "I have come to this land of Delphi, where, taking his seat in the very centre of the earth, Phoibos utters his chants to mortals, ever soothsaying to them that which is and that which shall be." Mr. Edison, in showing us that which is, and which we have not seen before, is also declaring that which shall be. Readers of the late Lord Lytton's "Coming Race" will now at least be obliged to own that we need no longer fear a coming invasion of a superior class of humanity; we are learning to be the "coming race" ourselves.

Mr. Edison appears to regard nature as containing all possibilities, which have only to be seen to be utilised. He scornfully rejects the idea that he is possessed of genius, or of any quality superior to those of common man. The thing is there, and has but to be seen; this is the formula of his invention, and he is ready to give his time to look for it until it is seen. Anybody could do that. So, in truth—anybody with the right sort of eyes. In spite of his repudiation of genius, Mr. Edison has what has been described as its eminent characteristic—the capacity of taking trouble. A Chinese sage averred that, if an ordinary man succeeds by one effort, the superior man will succeed by ten; if the ordinary man succeeds by ten, the superior man is prepared to continue his efforts up to a hundred. Mr. Edison, in spite of his unclouded brow and youthful air of inspiration, is ready to extend his efforts to thousands. While intent upon his aim, he will try the most unlikely projects, follow the most wrong-headed schemes which sound science would greet with scorn, but in the end something in him—call it infallible instinct, luck, inspiration, perseverance, or anything else—leads him into the right direction. One result—a very trifling little button to all appearance, but the crucial part of an invention—was reached after no fewer than three thousand experiments.

Americans love celebrities; they delight in interviewing and lionising. This is carried to such an extent that a number of people, unworthy of any special notice, are "written up" by the less important papers, in the true American style. It is fortunate when the unwearying interviewer meets with a celebrity so genuinely interesting, so wonderful in his own way, as Edison the inventor. How many times has his house been described, his personal appearance, manners, and habits given to the public, though he is still but a young man! Yet every account of him is full of interest, because his character is so remarkable. Mr. Edison is the magician of the nineteenth century; he has made of modern America a land more wonderful than any fabled country of the Arabian

Nights. His discoveries, though so practical and full of usefulness, are many of them of a kind that fasten upon the imagination. When he said of the statue of Liberty which overlooks the sea, "I can make that statue speak so that it can be heard ten miles," he touched a chord which must thrill through all imaginative persons. It is like returning to the days of one's youth when the wonders of Sindbad the Sailor were accepted in good faith, and all the marvels of fairy tales were believed to be true *somewhere*. It is small wonder that people travel only to look at a man whose powers so far transcend the formerly accepted limit of man's capacities.

Thomas Alva Edison came into the world—it has been said with a cigar in his mouth, for he is an inveterate smoker—on the 11th February, 1847. He is thus quite a young man, but, judging by results, would seem to have already lived several lives.

He was born in a village which bears a name full of charming associations, but which belies them in itself. Milan, in Erie County, Ohio, is not a marble city, but an obscure and wretched canal hamlet. His father was a man of splendid constitution, versatile abilities, and a restless nature. He was in turn tailor, nurseryman, dealer in grain, in lumber, and in farm lands. These qualities have all been transferred to his son, whose strength is extraordinary, and whose restless temperament seems insatiable. But otherwise he is an apparition in the midst of a family which, though strong, has not been remarkable. His mother (Scotch, though born in Massachusetts) was of good education, having been a school teacher in Canada, and from her he obtained all the definite instruction that he ever received. On the father's side his ancestry can be traced back two hundred years, to a period when the family were extensive millers in Holland. In 1730 the Edisons emigrated to America, and it is a matter of special pride with the great inventor that he can call himself a "full-blooded American." The new country has a power in the combinations of nationalities; the children of her vigorous soil hold in their veins the blood of other lands, and their characters are made strong by the mingling of elements. The Edison family have the Dutch sturdiness and the Scotch perseverance and canniness in their united stock. The race of Edisons has been long-lived. Edison's great-grandfather reached the age of 102, and his grandfather of 103 years; his father, a man standing 6ft. 2in., in 1868 outjumped two hundred and fifty men belonging to a regiment stationed at Fort Gratiot, Mich. Thus Thomas Edison has a fine physical inheritance; and although he has never had more than two months' schooling in his life, yet his mother was a finely-educated woman, and imparted a love of literature to her son. This was encouraged as far as possible, and his father used to pay him for every book he mastered. Thus, although he had an education which perhaps an Oxford man might regard as very desultory, it had that great and good result which so often systems of education fail to produce—the awakening of a passion which developed into a habit of knowledge seeking. It is true that this thirst for information must be a part of Edison's nature, or he could not have pursued knowledge with such an unfailing passion; but it is also true that to teach a child to read for himself and to desire information, is both a rarer and more effectual education than any college cramming or school system. His mother was industrious and ambitious; these qualities she imparted to him, and the habit of concentrated study which he early acquired has been of incalculable value to him. As a child, though not noticed in any way as being brilliant or remarkable, he was always busy, full of experiments and ideas. He was anxious to get to work when very young, and at the age of twelve he went as train-boy on the Grand Trunk Railway. He obtained the exclusive newsdealers' right between Detroit and Port Huron; he made a dollar a day at this time, which small fortune he handed over to his mother. When he first went to Detroit he began to read in the library, and started with the idea that he could read the whole of it. Under this impression he read through fifteen feet of a bottom shelf, and then gave up the attempt and adopted the more practical plan of selecting books from the general mass. In the course of this extraordinary progress of fifteen feet he had gone through Newton's "Principia," Ure's scientific dictionaries, and Burton's "Anatomy of Melancholy." There is something Titanic in the ideas this boy had of what he could accomplish; and certainly, when one reflects that he did accomplish fifteen feet of dry treatises without any skipping, it is plain that he was an omnivorous reader. Mr. Edison distinguished himself, while on this railway as train-boy, by turning a car, which was unused because it had neither springs nor ventilation, into a laboratory; but his great deed during this part of his career was publishing and printing a weekly paper on the train, called the *Grand Trunk Herald.* This wonderful paper was sold at 3 cents, and its subscribers numbered several hundreds. It was printed by the most primitive method, that of pressing the sheets with the hands upon the type, and on one side of the paper it was blank. The contributors were baggagemen and brakesmen. George Stephenson, our great engineer, when passing over the railway, saw Edison busy at his travelling printing office, and ordered an extra edition for himself. The *Herald* was shown by some traveller to the London *Times,* and was noticed as being the only newspaper printed on a railway. The paper ran for six months; but, alas! one day the water in Edison's phosphorus bottle evaporated, the fiery drug fell on the floor and ignited the car. The conductor with difficulty extinguished the fire, thrashed Edison, and threw the materials out of window, so that the successful career of the *Grand Trunk Herald* came to an unexpected termination. Its history is interesting because the features of it are characteristic of Mr. Edison's way through life: difficulties appear to add zest to his determination.

Telegraphy, from his first elementary insight into it, absorbed and interested him; became, indeed, a hobby. He made innumerable experiments in the cellar at home; the oddest of which was attempting to generate a current by means of rubbing a couple of cats vigorously at each end. The result was unsuccessful, perhaps partly in consequence of the very sudden departure of the cats. But soon Edison got a helper in his hobby, and this in consequence of an act of bravery and humanity on his own part. At Mount Clements station the operator's little boy of two years old crept in front of the cars; Edison sprang from the train and snatched him away, barely saving his life. The child's father offered to help Edison learn telegraphy, in gratitude for the brave act, and after that, when Edison had got to the end of his route, he would return to Mount Clements, working there at night upon his favourite study. After some five months of this he was able to obtain work in the telegraph office at Port Huron. He left it in six months because remuneration promised for extra work was not paid. After this he wandered about a good deal. He was perhaps a little too active in mind for the peace of superintendents. For instance, at Canada, the operators were required to report "six" every half-hour to the circuit manager. Edison got out of this by inventing a machine which would write the figure six and sign his office calls while he quietly slept. Although for various reasons he lost situations, he never seems to have lacked them, for operators were in request. At Cincinnati, where he worked a day wire, and "subbed" for the night men whenever he could obtain the privilege, he reached a new platform in his work. After he had been there three months, a delegation of Cleveland operators came to organise a branch of the Telegraphers' Union. On a certain evening the whole force struck, with a single exception, and left the office to go upon a great spree. When Edison came in as usual to practise, and found the office so nearly deserted, he took the press report as well as he could, and worked on through the night. The next day he was rewarded by an increase of salary and one of the best wires in the office, the Louisville. Bob Martin, considered one of the fastest senders in America, worked the Louisville end, and from the experience obtained by working with him, Edison dates his reaching this new platform—that of first-rate ability as an operator. Among his fellow-workmen at this time, Edison got the nickname of "luny" or crazy man; this was earned in a very innocent fashion, principally perhaps by his total indifference to dress, his passion for reading and for solving "impossible" problems. But it is aptly suggested that his pleasure in working at all hours had a great deal to do with it. A love of work for its own sake must be a very unintelligible quality to the ordinary workman, from what is generally seen of him. Edison could be induced to do other men's work, out of his good nature, and sometimes, when surrounded by dissolute and idle companions, would accomplish an enormous amount of labour. He would lend money, or he would spend it in books and apparatus, but in other respects he was abstemious almost to stoicism. In 1868 he appeared in Boston, where he began to find some real success. He was one of the most accomplished operators, and here some of his inventions began to be noticed. Yet he entered New York in a disconsolate and dispirited state, to find real success after the years of wandering which had preceded it. He hung round the office of the Gold Indicator Company for some days, when first in New York; their apparatus were constantly out of order, and at last one day Edison "happened in" just as a catastrophe of the kind had occurred. The superintendent was out, and Edison offered to fix the machinery. The president was amazed, but, being in despair, allowed him to try. He soon succeeded, and the next day he was offered an important post with the Company. He invented a printer of stock and gold quotations which they at once adopted; the Western Union Telegraph Company took him up. His fortunes had turned. He devoted himself to telegraphic inventions, and from thenceforth he "kept the path to the Patent office hot with his footsteps." Edison's inventions soon replaced the old apparatus of the gold and stock telegraphy, and the two companies who employed him paid him a large salary for the privilege of the first option of purchase of all his inventions relating to telegraphy. He started a great electrical manufacturing establishment at Newark, which was formed of three large shops and two laboratories; here he employed 300 men, and was himself the busiest man in America.

Mr. Edison is a phenomenon in his defiance of the ordinary rules of weakness which man is subject to. On one occasion he had accepted a very large order for improved printers. The first instruments for practical use proved a failure, and he could not discover the defect, till at last he took four or five of his best men and retired with them to the top floor of his factory, with the remark that they would never come down till the printer worked. He laboured for sixty consecutive hours, and when he left that top floor the printer did work. After sixty hours of such labour most men would have a brain fever, but Mr. Edison can rebuild his strength by a sleep of thirty hours. He says, however, that after going without sleep longer than usual he grows nervous, and ideas flow rapidly into his mind. This extraordinary capacity for labour places him in a very fortunate position; when he sees an idea he is capable of pursuing it to the last. He chooses his assistants not only for their skill and their willingness to do what he wishes, but also for physical endurance, which is very necessary to him. For himself he knows of no difference between day and night. Work appears to be the one great fact of his existence, and all the necessities of ease-loving mankind are subordinated to it. His labours throughout his life have been gigantic, and his ambition that of a giant rather than such as one would expect from a slim young American in the present day. But his natural insight into the powers of our world and the possibilities of our race carries him through those difficulties which to the blind and unbelieving would be impossible. Many of his inventions have a strangely doubtful value, which has made them very acceptable to the comic journalists. The *New York Times* suggested in 1878 that something really ought to be done to Mr. Edison, and that perhaps it had better be done with a hemp rope; the phonograph seemed to be altogether too much for that respectable paper. The idea that your friends might keep a concealed phonograph in their drawing-room, so that when you went to call you never dare whisper how ugly and ill-furnished the room was, while you were left alone in it—that idea was bad enough; but when it came to the aerophone, then the *New York Times* became serious. An invention which converts whispers into roars is really too much; as the *Times* pointed out pathetically, talk is the ruin of republics, and conversation the bane of private life. If America still wishes to preserve her great inventor, he should be requested to limit himself in the extension of man's powers to those which will add to our joys, and not to our already accumulated sorrows. Edison has unconsciously provided quite a new field for the comic sketcher: pictures of an exhausted and dying millionaire whispering his will into a phonograph; of a lady buying so many yards of a sermon, and so many of a lecture; of a prima donna singing to the great public in the seclusion of her own sanctum; and of safe war conferences by help of the aerophone, have made us all familiar with the funny aspect of these new powers. But with the laughter of all the comic papers in Europe ringing in our ears, we feel these things to be so grand that the ridicule is very ephemeral. These mysterious powers which lie about us, waiting for the man wise enough to find them out, are indeed awe-inspiring. We cannot guess to what dimensions we are capable of growing. Already, though pigmies in actual size, we are giants upon the earth, and convert the elements into our slaves; perhaps the future holds in its hand some power which shall enable us to break the bonds of this round globe, and speak with the far planets.

Mr. Edison's work for the science of telegraphy has been incessant and invaluable. From 1869 to 1873 Mr. Edison was engaged in a series of experiments in electric telegraphy, with a view to the improvement of the automatic telegraph by the invention of a system which should combine increase of speed with diminution of cost. The first automatic telegraph was originated by Alexander G. Bain, a Scotchman, in 1846, and the systems of subsequent inventors were developments and modifications of his, the main principle being retained in all—viz., the transmission of messages by means of telegraphic characters composed of groups of dots and dashes punched into paper. The perforated paper is introduced between two rollers connected with the wire, and a metal cylinder connected with the battery. The paper being a non-conductor, breaks the circuit between battery and line so that no electricity can pass over, but as the paper is moved forward, by hand or mechanism, the rollers and cylinder touch each other through such punctured holes in the paper as successively present themselves, and a current of electricity is transmitted along the line of wire. At the other end the current is received on a strip of paper prepared by chemicals sensitive to electricity, and the message is recorded by the decomposition of the chemicals through the action of the electricity producing marks on the paper. The three chief requisites for a perfect system of this kind are—first, a mechanism for puncturing the telegraphic characters swiftly and surely at one end of the line; second, a chemical solution appropriately sensitive to the electric current at the other end of the line; third, some method of neutralising the effects of what is known as the static discharge—a phenomenon common to all telegraph lines.

Mr. Edison set to work upon the punching apparatus, and found that the great obstacle to complete success was the difficulty of obtaining mechanism that should satisfactorily punch out the dashes; he therefore substituted for the dash an arrangement of three holes in close proximity, a larger one over two smaller ones. The electric current enters by the small dot-hole on the left, passes to the larger hole above, and thence to the small dot-hole on the right, thus making a continuous current, which records itself at the receiving end of the line as one continuous mark—in fact, a dash; thus the letter A in telegraphic character by a dot and a dash is punched as a dot and three dots, and records itself as a dot and a line; B, as two dots and a line, &c. The punching mechanism is connected with a keyboard, on which the operator can perform as on a musical instrument, striking each letter at will, and setting in motion the mechanism for punching it. The perforated paper is received into a box from which it is taken up by the machine. The speed averages thirty or thirty-five words a minute, but an exceptionally skilled operator attained to the speed of one hundred and ten words averaging five letters in each word.

Mr. Edison next turned his attention to the subject of the "static discharge." He found that a message sent at an average speed over a few miles only of wire was perfectly decipherable at the other end; but if either the speed or distance were increased, the message became blurred, and on further increase was received as one continuous line. This was owing to the surplus electricity, or static current, which accumulated in the wire and prevented the current from the battery from being broken by the intervals of non-conducting paper, and which continued after the discharge from the battery ceased. Mr. Edison arranged a magnet introduced into the circuit by means of a branch wire issuing from the main wire before it reached the receiver, and joining it again between the receiver and the earth. On reaching the branch wire the electric current parts into two, one portion passing along the main wire through the chemically-prepared receiving paper to the earth—the other following the branch wire. When this current, passing along the branch wire round the magnet, weakens in the least degree, an antagonistic current is generated by the magnet, part of which flows round the small circuit formed by the branch wire and portion of the main wire containing the receiver, while the remainder escapes to the earth. This antagonistic magnetic discharge neutralises the static discharge through the prepared paper. Another method of overcoming the effects of the static discharge is this: When the current induced by the battery ceases, the static electricity discharges itself at both ends of the wire. Consequently there is somewhere in the wire a neutral point where there is no flow. If the receiver is placed at this neutral point an incredible speed may be attained. By the use of a sufficient quantity of coiled line the neutral point may be obtained anywhere, *e.g.*, at either end of the Atlantic cable. New York has in this manner been made the neutral point from Washington, and a speed of three thousand words a minute obtained.

The recording of the message was accomplished by means of the metal point ending the telegraph wire meeting a sheet of paper moistened with water. The current of electricity decomposes the water into its elements oxygen and hydrogen. If the metal point be of iron, the liberated oxygen attacks it, causing rust. If to the water wherewith the paper is moistened be added a chemical which combining with the rust gives a colouration to the paper, the automatic record is complete. If an iron point is used, the ferro-cyanide of potassium will unite with the particle of rust on the point and form Prussian blue. If a tin point, another chemical is used, and another colour is produced. With this enormous increase of speed to 3000 words a minute, a more sensitive solution than any hitherto used became necessary. Mr. Edison spent many months in the search for an appropriate metal and chemical, and tested many hundred working solutions. At last he hit upon the combination of the metal tellurium with paper steeped in salt water. This union produced the most perfect success. It differed from the previous combinations in that it is the hydrogen instead of the oxygen which is the active agent—forming with the tellurium a yellow compound, which quickly blackens on exposure to air. The tellurium has the additional advantage of cutting off the signals very sharply, thus aiding in overcoming the static discharge from the line. The purpose of the salt is to render the paper a better conductor, so that the water may be more rapidly decomposed.

The inventor succeeded in recording the Lord's Prayer in distinct characters in the space of an inch. To obtain a record of 3000 words a minute, each word averaging five letters, and each letter five electrical impulses, the metal and chemical must act on each other, producing a new chemical combination 45,000 times in one minute. Our speech may reach 160 words a minute. A good telegraph operator writes about forty words a minute; therefore the wire can carry as many words as twenty men can speak, talking as fast as they can, or eighty men copy in the same time. During the first year that Mr. Edison's machine was in use between New York and Washington it transmitted more than three millions of messages. Owing to litigation with rival companies, the use of it has had to be discontinued until the questions involved have been settled in the courts. During the time that the system was in practical operation the inventor was at work upon a machine which should perforate and record in the form of Roman letters, so that thus the paper might be taken direct from the wire, and delivered to the person addressed. He also conceived the idea of a small perforating machine by means of which anybody might punch his message at home and send the strip to the telegraph office for transmission. The company proposed to charge so much a yard, instead of so much a word, for the transmission, leaving the sender free to crowd as much as he liked into the space.

Unfortunately, the litigation put a stop to the entire system, and for lack of funds these portions of the invention have never been perfected.

Another apparatus which Mr. Edison has perfected and patented is his quadruplex telegraph, by which four messages may be sent at the same time over the same wire. Two currents of diverse strength can be transmitted simultaneously in the same direction without interfering one with another, just as a ripple and a great wave may run on the same stream of water at the same time. Other two diverse currents may be transmitted in the opposite direction, and, unlike waves of water, they will meet and pass the first two without causing disturbance to any of the four. The quadruplex apparatus was used with excellent results by the Western Union Telegraph Company. The electric pen for multiplying copies of letters and drawings is another of Mr. Edison's patents, of which he owns one hundred and fifty. Of these about a dozen are of real importance; the others have been taken out rather as guards against possible infringements of the more valuable patents.

Among so many marvellous inventions, the most marvellous, at all events to the popular mind, are the varieties of speaking machines with which Mr. Edison's name is associated. It gives the impression of one's having strayed into a romance of Wonderland, instead of contemplating the solid science of a solid earth, when it comes to bottling up speech and setting it on a shelf, to be uncorked a century hence like good port wine, or when words can be spoken into a machine, whence they shall reissue hundreds of miles away, according as may be desired, either in a great big gruff voice like that of the huge bear in the fairy-tale, or as the middle voice of the middle-sized bear, or else as the little wee soft voice of the wee-wee bear.

At the time when Professor Bell exhibited his first telephone, Mr. Edison had in his laboratory a precisely similar apparatus which he had devised some months before, for the purpose of reproducing the vibrations of a tuning-fork. Had he chanced to sound a vocal note, or utter words into this device, he would have anticipated Professor Bell in the discovery of the magneto-telephone. As it was, Professor Bell's patent, though not interfering with Edison's right to use his own machine as a reproducing apparatus for sound, debarred him from using it for the purpose of transmitting vocal effects. He therefore set to work about the invention of a galvanic transmitter. The graduated sound-waves of the human voice as received on the diaphragm of the telephone must be represented by equally graduated waves of electric current; a series of experiments was therefore entered upon with the object of determining whether any matter or compound existed, or could be formed, which would supply by its expansion and contraction a sufficiently delicate variation of resistance to produce the desired effect of increasing and decreasing the resistance of a current. He began at one end of his stock of chemicals, and tried them all—some two thousand. He found that various forms of carbon responded the best to the vibrations produced on the diaphragm of the telephone by the human voice, but none were perfectly satisfactory. He was looking round for something else to try, when his assistant brought him the broken chimney of a kerosene lamp, encrusted with lampblack from the smoke. This he scraped off, and moulded into a button about the size of a sixpence, experimented with it, and the result was a complete solution of the problem. He had now a complete telephone, independent of that of Professor Bell, and superior to his, in that the strength of the currents is not limited by the vocal power. Thus longer lines could be worked, and a greater volume of sound obtained from the receiving instrument. The carbon telephone was patented in England in 1877. But Mr. Edison's labour was only half accomplished by the perfect carbon transmitter. He next set to work upon an electro-chemical receiver. In the series of experiments already recorded in automatic telegraphy with the metal point and chemical solution, he observed this phenomenon: When a strip of paper, steeped in a solution of certain chemicals, was subjected to the action of the electric current, its surface became smoother. As soon as the current was withdrawn, it regained its normal character. If the strip of paper were placed upon a metal base connected with one pole of a volcanic battery, and a strip of platinum wire connected with the other pole were pressed firmly down on the paper and moved along by muscular force or clockwork; then, despite the downward pressure, the platinum strip would move along freely as long as the current continued, but if the current were interrupted, the motion of the wire would be instantly stopped by the normal friction of the moist paper. Endeavouring by additional force to overcome this friction, and at the same moment restoring the electric current, it was found that the wire would be instantly released, and would involuntarily slip over the paper as if upon ice. Here was a power to put in motion matter at a distance by means of electricity without the intervention of an electro-magnet. Mr. Edison applied this new principle to the telephone, substituting a cylinder of chalk, saturated with an alkaline solution, for the original paper, the friction of the chalk being more uniform owing to its finer particles. The cylinder is mounted on a shaft which is rotated by a hand crank. A brass strip faced with platinum, attached to the centre of a disc of mica, projects over the cylinder, and bears with considerable pressure upon the chalk by means of a spring. The electric current is made to pass from the brass strip to and through the chalk cylinder at the point of friction. When the crank is turned so as to rotate the cylinder outward from the face of the disc, the friction between the cylinder and strip drags the centre of the disc inward more or less. If now an impulse of electricity is passed over the wire, the friction is destroyed and the disc by its own tension regains its normal position. Thus the disc is drawn in one direction by the friction, in the other by its own tension; when this is united with the carbon-transmitter, we have a perfect telephone, and such power can be obtained as will cause the reproduction of the voice in greater or less volume than was given forth by the transmitter. It can either whisper a secret or roar a command. One day, while experimenting on an automatic telegraph transmitter, Mr. Edison tried tinfoil to receive the indentations of the recorder instead of paper, and was surprised to see how readily it received them. These identations, passing under another needle, were to repeat the message automatically to another wire. A few days later, the fancy seized him to fix a needle point to the diaphragm of a telephone, and try whether the vibration of the diaphragm, when spoken against, would cause the needle to prick his finger. It did so, and he wondered what would be the effect on a slip of paper. He tried the experiment, and, sure enough, there was a sort of indented track; Then it occurred to him to try what would result from drawing this indented slip under the point again, following the working of the automatic transmitter. The effect was one which almost made him wild. A sound like a smothered cry of words seeking utterance issued from the diaphragm. He worked, oblivious of food or sleep, until he had made a grooved cylinder, and put a piece of tinfoil on it—to this he attached the diaphragm and shouted into it. On turning the crank the words were reproduced with distinct articulation and marvellous elocution, and the phonograph took its place among the wonders of the day. While pursuing experiments in electric lighting, Mr. Edison developed some striking phenomena arising from the heating of metals by flames and by the electric current. After further investigation of the phenomena, he succeeded in condensing certain metals so that they increased in density four or five times beyond what had hitherto been deemed possible. The series of experiments also referred to the volatilisation of metals *in vacuo*. He succeeded in obtaining with a condensed platinum wire with a radiating surface only about equal to a grain of buckwheat an electric light equal to the light of eight standard candles. The wire before being subjected to this process would scarcely give out the light of one candle. Thus he is enabled, by the increased capacity of platinum, to withstand high temperature, to employ small radiating surfaces and reduce the energy required for the light. Mr. Edison's electric light machine combines the smallest resistance with the greatest electro-motive force.

Mr. Edison has, notwithstanding his being the wizard of the d ay a humorous side to his character, and an imperturbable good humour, yet even he must find it difficult to be amused with the curiosity of the sight-seeing public. In 1876 he moved out to Menlo Park, some twenty-four miles from New York, where he hoped he would, at a sufficiently inconvenient distance from the city, be comparatively free from visitors. But it was no use; a gentleman asked the privilege of presenting a few friends; he arrived on the scene with a small party of one hundred and seventy-five persons!—and it is nothing uncommon for a "special train" full of visitors from Boston to be announced. Edison may be driven yet to carry out a natural law and throw out some device for his own protection. He does allow sometimes that he will probably be tempted to "blow up somebody yet;" and he once declared that he was considering the idea of connecting a battery with his gate, so that everybody who touched it should be straightway knocked down.

Menlo Park is a little hamlet, quiet enough in itself, a mere group of some half-a-dozen yellow and chocolate houses. Upon a hill Edison has built his laboratory. On the ground floor he has a machine room, where there is an engine of ten-horse power and a collection of expensive tools, so that any appliance can be made under his own eye. He has a costly scientific library; but his great possessions appear to be those which are of use to him in his work. He has thousands of bottles containing chemicals, and he makes a point of having some of every known chemical or mineral, in case he should need it.

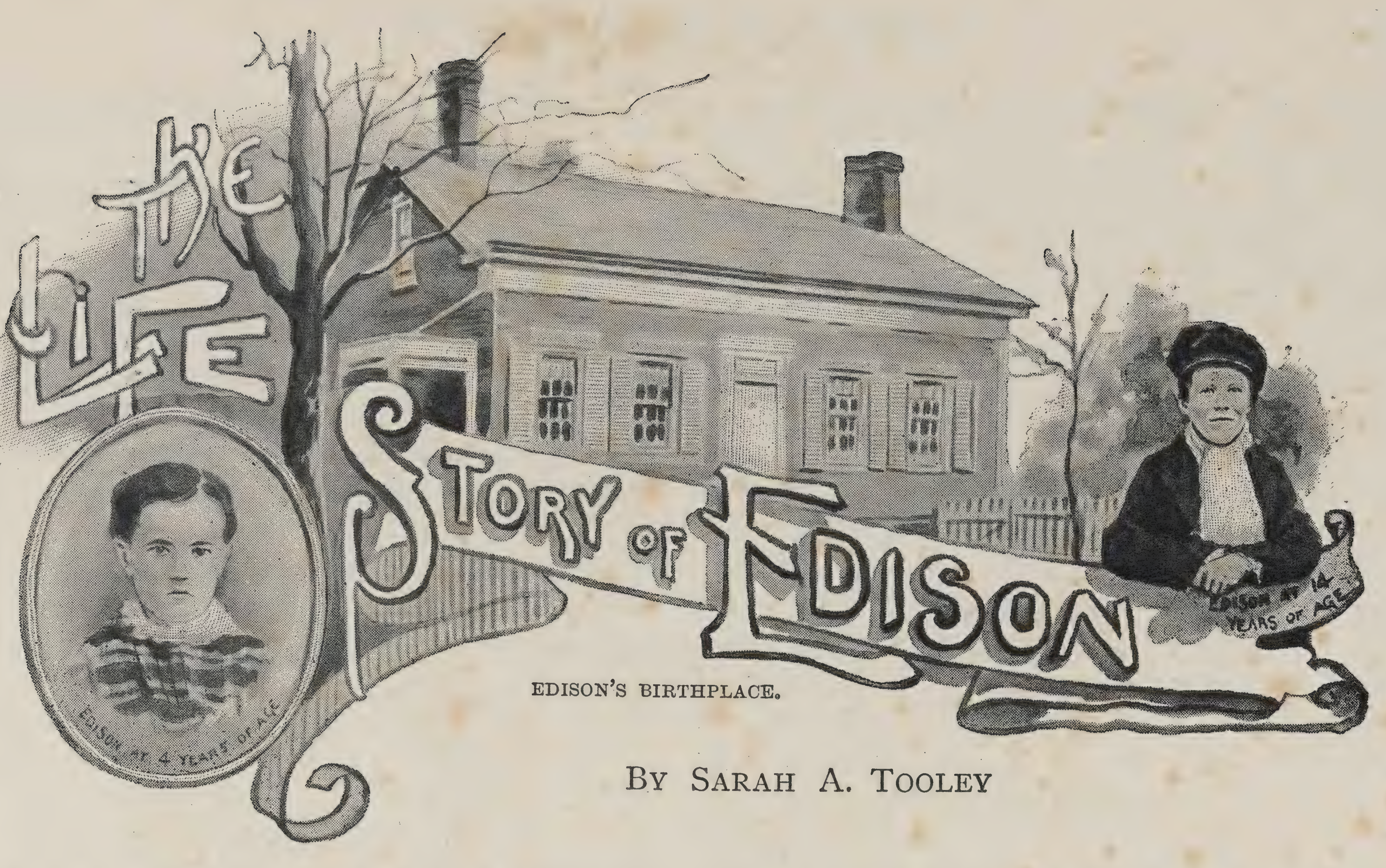
When you go to his house he may very possibly answer your inquiry for "Mr. Edison," himself; or, if not, you will be shown into his laboratory, where you will find him among his assistants; and if you try to guess which is Mr. Edison, your best plan will be to select the least obtrusive person in the group. His figure is slight and young-looking, though the face, from its long habit of concentration, has an old look; he has a frank, cordial expression, and, like most men of great powers, can be almost a boy when his attention is turned away from his absorbing interests. But when he is not roused, he seems to retire within himself as if his mind had travelled a long way off, and his attention comes back slowly. He has the peculiar pallor of a night-worker, and if you stay with him through the night you will find him as bright at the end of the vigil as at the beginning.

As Edison is said to be somewhat timid with ladies, it is pleasant to know that he has married, and married well. His wife was a lady telegraph operator. His two little ones are nicknamed Dot and Dash after the letters of that telegraphic alphabet which has been so interwoven with their father's life. Now and then they visit the scene of these wonderful labours of their father, to amuse themselves with that invariable delight to children, seeing "the wheels go round."

When Mr. Edison chooses to vary his vast labours by a holiday he is sure to be welcomed anywhere. People are glad to have him only to look at. But he does not always succeed in pleasing those whose idea of entertaining a lion is to feast him. Invited to dine at Delmonico's, that restaurant which has become historical from the celebrities it has feasted, he astounded his entertainer by contenting himself with a piece of pie and a cup of tea. If anybody has a right to say such a thing, certainly Edison may justify himself by saying he has no time to cultivate Epicurean tastes. Many people make this kind of excuse for not sharing in the tastes of most men, who would succumb at a hundredth part of the work Edison accomplishes. He must needs have holiday sometimes; but his difficulty would probably be how to escape from the great public eye. He laughingly said, a year ago, when speaking of taking a rest, "The proprietors of White Mountain hotels have generously placed that region at my disposal. They even offer to place a locomotive at my command. If I can get there I shall talk ten miles, from one peak to another, with my telescopophon!"

He admires Victor Hugo and Jules Verne; small wonder, for to him no flight of imagination can seem absurd, and these authors are rather suggestors than romancists. And what a hero must Edison be to the boys who read Jules Verne. Let them picture to themselves a living man, who, when he talks of going to the White Mountains for a holiday, proposes to amuse himself by talking to his friends from peak to peak!

THE LIFE STORY OF EDISON


Edison at 4 years of age
Edison at 14 years of age

EDISON'S BIRTHPLACE.

By Sarah A. Tooley

It is not easy to conduct an interview across the Atlantic even though the cable be in excellent working order; and Mr. Edison, in consideration of this, and of the fact that we were not connected by phonograph, kindly suggested that the simpler plan would be to base my sketch of his career upon the data with which he had already supplied his friend, Mr. W. R. Dickson, for his work, the *Life and Inventions of Thomas Alva Edison.* I have carefully refrained from repeating any of the tempting little stories which are current, unless specially authorised by Mr. Edison himself, to whom my best thanks are due for his kind courtesy.

The American ancestry of Mr. Edison dates back to 1737, when his family emigrated from Amsterdam and settled in the States. His great-grandfather was a wealthy banker on Manhattan Island; and his father, Mr. Samuel Edison, a vigorous old patriarch still tilling his land in Florida, after various vicissitudes of fortune settled in a humble home at Milan, Erie County, Ohio, where his illustrious son, Thomas Alva Edison, was born February 11th, 1847. It may perhaps be said that the inventor owes his fine healthy physique to his father and his genius to his mother. The record of robustness and longevity amongst the Edisons is remarkable: the great-grandfather of the subject of our sketch lived to be nearly one hundred and three years old, his grandfather exceeded that age by seventeen days, while one of his aunts lived to be one hundred and eight years old. His mother, whose maiden name was Nancy Elliot, was of Scottish parentage, born and reared in Canada. She was a woman of natural refinement, intellectual tastes, and withal of so sweet and sympathetic a nature that we cannot wonder that her famous son cherishes her memory so fondly, and feels that his success to-day is due to the sympathy and inspiration which she gave him as a boy. The good woman was not without the usual trials which beset the mothers of geniuses, which are quite bad enough if the son be a born naturalist like Thomas Edward, and conceals "beasties" in every nook and cranny of the house and keeps a jackdaw concealed in his "breeks," but which become intensified when the boy is a budding electrician and rigs up amateur laboratories filled with explosive material.

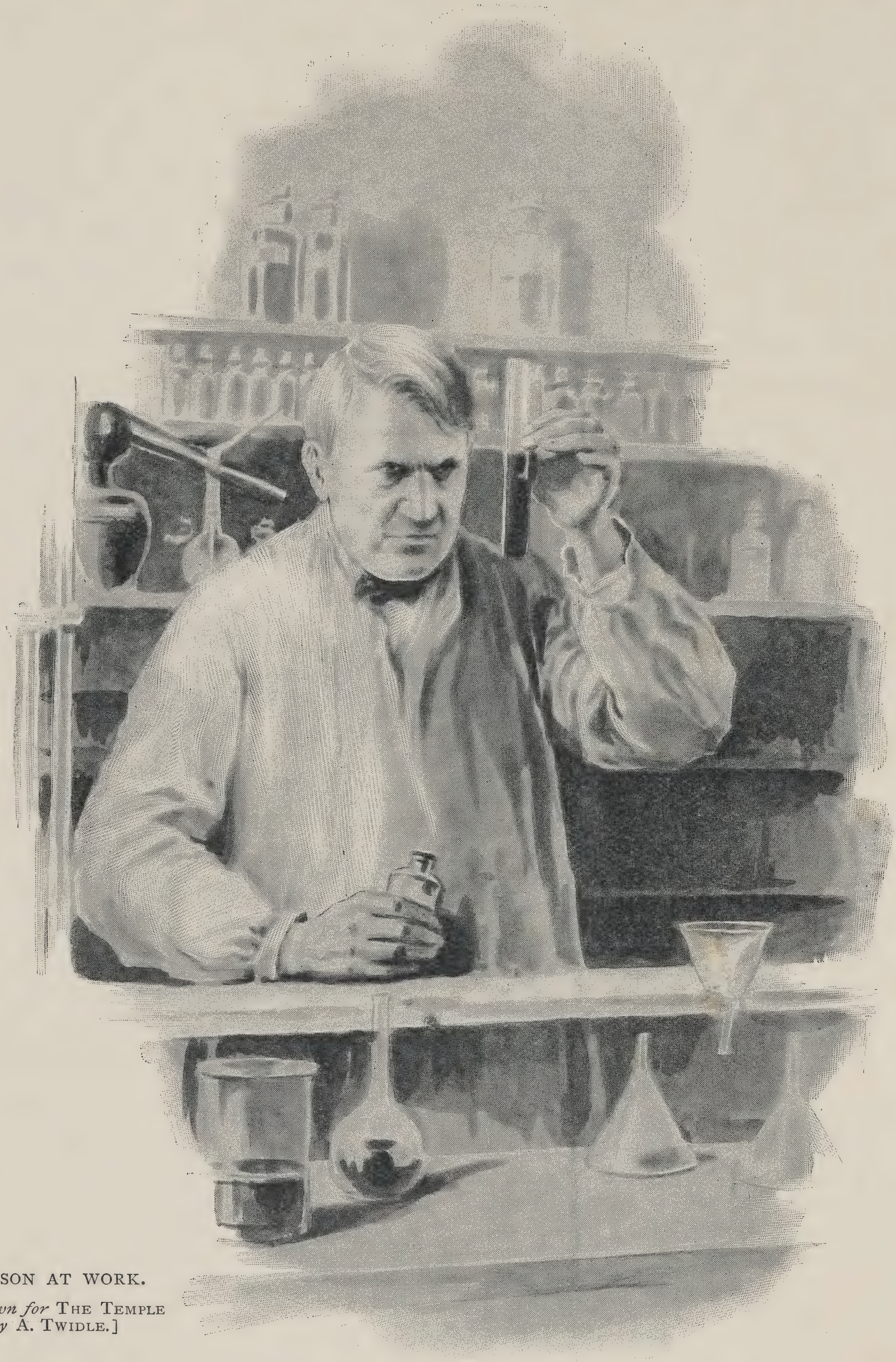
It would seem, however, that the early bent of Edison's mind was more literary than mechanical, a taste which Mrs. Edison fostered. We find him as a boy studying the *Decline and Fall* as assiduously as Silas Wegg, and struggling with such works as Burton's *Anatomy of Melancholy* and Newton's *Principia*, starting to read through the whole of the Detroit Free Library, and actually succeeding in reading fifteen feet of closely packed volumes before he was persuaded to desist. The first seven years of his life, spent in his picturesque birthplace at Milan, Ohio, where his parents lived in comparative ease and comfort, were the brightest of his boyhood. Afterwards came a decline in the family fortunes and the removal of his parents to the town of Port Huron, Michigan, and his literary ardour suffered from the paucity of pocket-money. But, with true American enterprise, young Edison, aged fourteen, started in business for himself; it was only as a vendor of news-papers on a railway car, it is true, but it proved to be the tide in his affairs which taken at the flood led on to fortune. It was during the Civil War, when excitement for news was at its height regarding the battle of Pittsburg Landing, that "Tom" Edison persuaded the editor of the *Detroit Free Press* to let him have a thousand copies of the paper as stock-in-trade, to be paid for on realisation, to sell from the cars of the Grand Trunk Railway; he further conceived the ingenious plan of getting his news bulletins exhibited on the official blackboards along the line, prior to the arrival of the train which bore him and his papers, with the consequence that excited crowds of eager buyers were in waiting at every station. Mr. Edison thus describes his first start in business: "At Utica, the first station out from Detroit, I usually sold two papers at five cents each. As we approached the station on this day, I put my head out to look forward, and thought I saw an excursion party. I had half a dozen papers only in my hand, and, seeing that the crowd began to shout and gesticulate when they saw me, I guessed it was papers they wanted, and rushed back, grabbed an armful, and when I reached the platform sold forty. Mount Clement was the next station. When it came in sight, I thought there was a riot. The platform was crowded with a howling mob, and when the tones became intelligible I realised that they were after news of Pittsburg Landing, so I raised the price of papers ten cents, and sold a hundred and fifty where I had never before disposed of more than a dozen. As other stations were reached, these scenes were repeated; but the climax came when we got to Port Huron The station there was a mile from the town. When the train stopped, I shouldered my bundle and started for the city. When I got less than half-way, I met a crowd hurrying toward the station. I thought I knew what they were after, so I stopped in front of a church, where a prayer meeting was being held, raised the price to twenty-five cents per copy, and commenced to take in a young fortune. In two minutes the prayer meeting was adjourned, the members came rushing out; and if the way coin was produced is any indication, I should say that the deacons hadn't passed the plate before I came along."

Having been so successful as a news-seller, Edison lost no time in becoming an editor and publisher, and like Garrison—

> What need of help? He knew how types were set,
> He had a dauntless spirit, and a press.

True, Tom Edison's press only consisted of a disused set of type purchased for a mominal sum, and his combined printing office and editorial sanctum was a dilapidated luggage van, but it possessed an advantage of which even Printing House Square cannot boast—it was migratory. The van converted to this novel purpose was attached to the train, on the Grand Trunk Railway, of which the young editor was newsboy, and appropriately enough the paper was entitled the *Grand Trunk Herald.* A further venture was *Paul Pry*, in which, if one may be excused a pun, the editor "pryed" into things in too free a manner; and some individuals, incensed at his fun at their expense, dipped him into the river to cool his imagination. Further disaster followed when one day a phosphorus bottle upset in his laboratory and nearly set the train on fire. The conductor promptly removed Edison and all his apparatus, printing and chemical, on to the platform at the next stopping-place. It was a bitter moment, of which Mr. Edison cannot to-day think without feeling over again the sense of utter hopelessness and desolation which came upon him when he saw the train whirling off while he stood alone and forsaken amongst his broken gods, his ear tingling with a brutal box which injured his hearing for life. There is usually the mother's heart which under such circumstances will go out in pity to the disappointed lad, and Edison found a lodgment for his belongings in the cellar at home, and a loving heart to give him courage.

From journalism the embryo inventor turned more particularly to the study of telegraphy, and by dint of much self-denial and many clever contrivances he was able to purchase books and materials and to conduct some successful experiments. Then came the well-known episode when he earned the gratitude of a railway employee by rescuing his child from being crushed to death by a locomotive. The father having no money to bestow upon the brave youth, offered to teach him telegraphy—an offer eagerly accepted. Soon Edison was proficient enough to gain employment as an operator on the railway line, and clever enough to devise certain little labour-saving contrivances for his own benefit, which were not so warmly appreciated by his employers. A climax was reached when by a grave infringement of duty the over-clever telegraphist nearly caused a collision. We cannot do better than let Mr. Edison describe his youthful escapade himself. The general manager having



EDISON AT WORK.

[*Drawn for* THE TEMPLE *by* A. TWIDLE.]

summoned him to his august presence, said—

"'Young man, this offence of yours is a very serious one, and I think I shall make an example of you. I can send you to the Penitentiary for five years, and'—

"Just at this moment," continues Mr. Edison, "two English swells came in, and Mr. Spicer, the manager, now all affability, rose to greet them. They engaged him in conversation, and, as I couldn't see that they really needed me around there, I slipped quietly out of the door and made for the freight depôt, where I found a train about to start for Sarnia. I knew the conductor, told him I had been down in Toronto on a little holiday excursion, and said I'd like to take a run up the line with him as far as Sarnia. He told me to jump aboard, and I wasn't long in getting out of sight; but my pulse didn't get down to normal work until the ferryboat between Sarnia and Port Huron had landed me in the latter town. I haven't been in Toronto since that time, nor have I yet received the pay due me up to date." We may also add that the Penitentiary has not up to the present time sought to claim Mr. Edison.

For the next few years he led an itinerant existence, now finding employment as an operator in one place and now in another, but always distinguishing himself by some brilliant contrivance or experiment. His creative genius now began to assert itself, and the most important outcome of it was an automatic repeater—an instrument by which, in telegraphy, writing could be transferred from one line to another independently of the operator. This his first invention was made when he was a raw lad of seventeen, ill-clad, ill-fed, crippled on all sides for want of money to buy books and scientific materials, but full of indomitable pluck. He was undoubtedly an erratic genius, and seems to have been for ever getting into hot water with his employers, who occasionally, in spite of his cleverness, intimated that they preferred his room to his company. He seriously injured his health by burning the midnight oil too freely, denying himself even the necessaries of life that he might be able to buy the things to carry on his investigations. Although a roving wayward youth, fond of a "lark," young Edison was an example to his associates in all points of moral conduct, and acted as mentor and good angel to those less steady and abstemious than himself. Occasionally he had four or five scapegraces sharing the hospitality of his room at one time, and they were not always of the most grateful kind, as the following story will show. At this period Edison was spending every spare coin upon books, and had lately become the proud possessor of fifty volumes of the *North American Review* purchased at an auction. His face glowed with pride as he arranged the precious volumes around the walls of his room until it had the appearance of a library. Some half-dozen young gentlemen of scientific ardour were at this time getting a free lodging with Edison, and one evening when deep in their cups they carried off their host's library to the pawnbroker's and disposed of it. When Edison returned from work in the early morning, he "felt," he said, "that this was running hospitality to the ground," and promptly ejected the two of his guests who had remained in his room to sleep off the effects of their spree.

It was while at Louisville office that Edison's career received another check. He could not resist the temptation of using the Company's instruments and chemicals for experiments, and one night, when taking some sulphuric acid from the battery room, he upset the chemical, which ate up the floor, descended below to the manager's room, and ate up his desk and the carpet. Next morning he was summoned before the Board, and told that they wanted a telegraph operator, not an experimenter, and that he might take his pay and go. After two years spent in situations at Cincinnati and at his home in Port Huron, during which time his insatiable love for books and scientific appliances always kept him in an impecunious condition, he set out to seek his fortune in Boston. He tramped the distance in four days and four nights, and when he presented himself at the manager's office he had an unkempt and uninviting appearance enough. However, a chance was given him to see what he could do, and his fellow-operators contrived a little plan to "put a job on the jay from the woolly West." He was told off to take a report for the *Boston Herald*, and the conspirators contrived to have one of the fastest senders in New York to send the despatch and "salt" the new man. Amidst smothered laughter from those in the office, Edison sat down unsuspectingly to his work. It happened, however, that one of his accomplishments was a simple and rapid style of handwriting, which enabled him to meet the demands of the operator at the other end of the wire with composure. Put on his mettle, the man increased his speed; Edison with equal success increased his. Then the sender began to slur the words and other tricks likely to cause confusion; but Edison was not discomfited. Finally, when he thought the fun had gone far enough, he opened the key and remarked, "Say, young man, change off and send with your other foot." After this came the collapse of the New York man and immense popularity for "the jay from the woolly West." In Boston the young inventor met kind friends in the office managers, Mr. Adams and Mr. G. F. Millikin, who saw beneath his uncouth exterior the marks of genius. In the encouraging atmosphere of appreciation Edison's gifts found rapid development, and, relieved from the cruel pressure of want, his physical powers became stronger, and the more genial and humorous side of his nature came into play. Amongst the little inventive contrivances of this period was an electric battery for destroying the cockroaches which infested the office. This invention, we believe, has never been patented by Mr. Edison, or it might have proved a boon to the London cook who inhabits an area kitchen.

During this Boston period Edison's brain was fired by the study of Faraday's works on electricity, and, after sitting through the early hours of the morning poring over the first volume, he suddenly said to his companion, "Adams, I've got so much to do, and life is so short, that I am going to hustle."

Experiments in the manufacture of nitroglycerine followed; and Edison at this time also made an electrical apparatus for recording votes in the Legislature. He was justly elated with the success of the instrument, but judge of his astonishment and disappointment when told that his invention was too perfect —in short, it permitted of no filibustering tricks in the Legislative Assembly, and he was informed that the House would not use it even if he paid them to.

"Ever after that," says Mr. Edison, "I investigated minutely the necessity of any particular invention before I attempted its reduction to practice. To this decision I have made it the rule of my life to adhere."

Such an eminently correct young man was Edison deemed in Boston that he was invited to lecture before a fashionable ladies' college upon telegraphy. So absorbed, however, was the lecturer upon his experiments that he seems to have been oblivious of the sex of his audience, and indeed had forgotten the appointment altogether, until a friend rushed in at the last minute and carried him off in his working clothes to the seminary, where the unexpected sea of upturned faces of fair scientists almost caused his tongue to cleave to the roof of his mouth. Interest in the subject gained the day, and after the first stammering plunge Edison did bravely; and it is to the credit of the girls that they thought more of his knowledge than of the deficiencies in his toilet, and on all future occasions when they encountered him bestowed so many smiles and bows upon him as to be embarrassing to a modest youth.

When Edison was twenty-two years of age, and had already made valuable discoveries in several branches of telegraphy, he left Boston for New York, arriving in the latter city in his chronic state of impecuniosity. There was a panic in Wall Street, and the newcomer, lounging outside the great Exchange, learned that something was wrong with the telegraphic communication, and that business had been almost brought to a standstill. In the tumult Edison slipped into the office of Law's Gold Reporting Company, discovered what was wrong with the stock quotation printer, and informed the astonished manager that he could put the machine in order, which he at once proceeded to do, with the result that he was engaged by the Company at a salary of three hundred dollars a month,—to him comparative riches, and which enabled him to develop some of the ideas which had long been seething in his brain. The Edison stock printer was the first outcome of his improved conditions, and other private printing telegraphic appliances followed. An opportunity for selling his patents offering itself, the inventor thought to himself that he might take five thousand dollars for them; but the Gold and Stock Telegraph Company, with which he was now connected, made an offer of forty thousand dollars.

"I believe," says Mr. Edison, "I could have been knocked down with the traditional feather, so astonished was I at the sum, and I concluded there must be some Wall Street trick about this thing, and that if ever I got a cent I should be lucky. After signing the agreement, I received the cheque, and proceeded to the bank with it. I had never been in a bank before, so I hung around in order to see the methods of procedure, then took my place with a row of boys at the paying-teller's window. When my turn came and I presented the cheque, the paying-teller yelled out a lot of jargon, which I failed to understand on account of my deafness; again he roared something at me, but I could not catch it, so left my place and passed on. Sitting dismally on the steps of the bank, I concluded that I was never fated to see that money, and so hopeless did I become that anyone might have bought that cheque from me for fifty dollars. However, I went back and told one of the clerks in the Company's office about the bank episode, when he explained that the teller evidently wanted me to be identified. He then went back to the bank with me, performed the ceremony of identification, and the money was at once paid, greatly to my astonishment. In thirty days I had fully equipped a shop of my own—an investment which left me very little money."

The one small shop soon developed into others, and from them a large number of inventions relating to telegraph printing were turned out. In 1873 he entered into a compact with the Western Union Telegraph Company and the Gold Stock Company to give them the exclusive right to his inventions. A handsome salary was paid him, and he was soon established in a commodious factory at Newark, with a working staff under him of three hundred men. His career from that period has been one unbroken success. To enter into detail regarding the inventions which seem literally to pour from his brain is impossible in the compass of this article. If when only twenty-four he was described as "a young man who has kept the path to the Patent Office hot with his footsteps," what is to be said of him to-day? His duplex and quadruplex systems, which took six years to perfect, introduced a revolution in telegraphy, and were perfected during the Newark days. He tells the story that when deeply immersed in these studies he forgot to pay his taxes, and received the usual summons that if they were not paid by a certain hour next day he would have twelve and a half per cent. extra to pay. He took his place in a string of delinquents at the City Hall with the intention of paying them, but deep in the quadruplex system he forgot what he had come for.

"Now then, young man, look sharp, what is your name?" roared the tax official.

"I don't know," sublimely replied the inventor.

Finally he was waved aside as a person of weak mind, and, the time limit having been reached, he found, when he at length recollected his name, that he had the twelve and a half per cent. extra to pay.

After the establishment of the Newark factory Mr. Edison's fame as an inventor spread far and wide, and people thronged the place to see the wizard of electricity at work. This led him to remove to Menlo Park, about twenty-four miles from New York, where he built a large and magnificently-appointed laboratory, expending a hundred thousand dollars on experimental apparatus alone. "When the public tracks me out here," he said, "I shall simply have to take to the woods." The rustic inhabitants of the district regarded him as an uncanny magician, and tales of the most extravagant description were whispered regarding the miracles which took place in the big new factory suddenly set down in this desolate region. And indeed the rustics were not far wrong; for when we consider the marvellous properties of that delicate instrument the micro-tasimeter, one of the many evolved at the Menlo Park factory, it seems little short of miraculous that the human brain could have conceived it. The tasimeter is constructed to measure degrees of heat and moisture, and so sensitive is it that it can register the heat from the human body standing eight feet away. The odoroscope and the microphone, for measuring odours and sounds, are modifications of the tasimeter. The megaphone — another invention belonging to this period—is an instrument by which remote sounds are brought near. By it people miles apart can converse with ease; but the most wonderful result of the power of this magic contrivance was when the sound of sheep crunching grass six miles away was made audible in the factory at Menlo Park. Possibly, the most widely-known of all Edison's inventions are the telephone and phonograph, and the latter was discovered by the merest accident—namely, an accident happening to the right man.

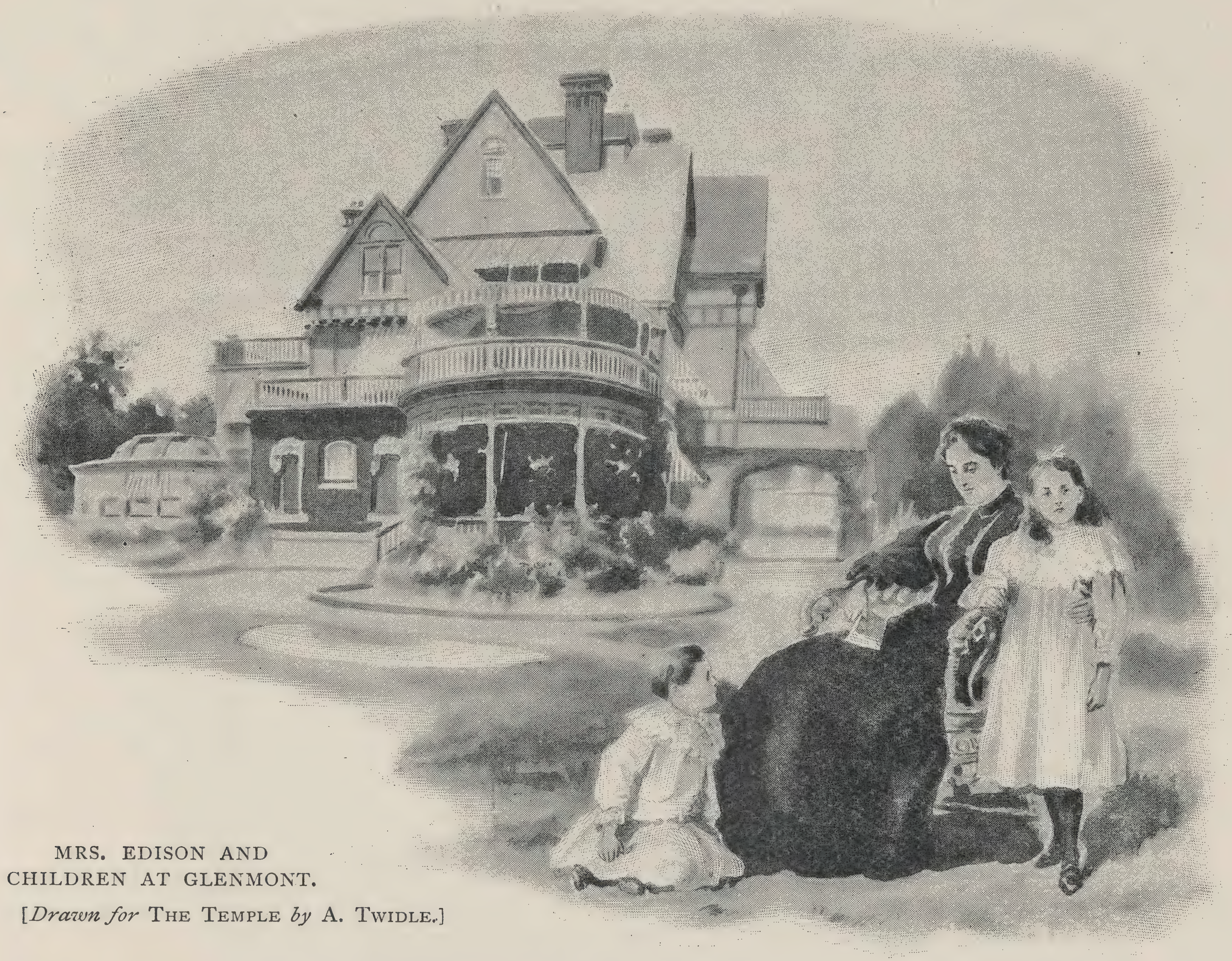
"I was singing," says Mr. Edison, "to the mouthpiece of a telephone, when the vibrations of the voice sent the fine steel point into my finger. That set me to thinking. If I could record the actions of the point and send the point over the same surface afterward, I saw no reason why the thing would not talk. I tried the experiment first on a strip of telegraph paper, and found that the point made an alphabet. I shouted the words 'Halloo! halloo!' into the mouthpiece, ran the paper back over the steel point, and heard a faint 'Halloo! halloo!' in return. I determined to make a machine that would work accurately, and gave my assistants instructions, telling them what I had discovered. They laughed at me. That's the whole story. The phonograph is the result of the pricking of a finger."

All this sounds remarkably simple, and Mr. Edison has a habit of speaking of his inventions as though they had dropped from the clouds; but needless to say, after the principle of the phonograph had been discovered, there were days and nights of anxious thought and experiment before the famous talking machine, with which even the nursery is familiar to-day, had reached its present perfection. It had quite a simpering delicacy at first; and when Mr. Edison would in full tones roar "Spezia," for instance, into the phonograph, it would reply "Pezia" in lisping accents. The inventor has spent fifteen to twelve hours a day for six months in succession dinning that one word "Spezia" into the machine, until it was constructed to re-echo it back with perfect intonation. At another time he would sit for days at a time gravely repeating,

> Mary had a little lamb,
> A little lamb, *lamb*, LAMB,

until the poor phonograph must have wished that Mary and her pet had never existed. The wonderful instrument was first exhibited in this country at the Crystal Palace in 1888, when most successful messages were given out from Mr. Edison in America, and the exact reproduction of his voice quite startled his friends in London. The following year the new invention was the marvel of the Exhibition in Paris.

For many years, while the inventions to which we have briefly alluded had been shaping themselves in his wonderful brain, Mr. Edison had been studying and experimenting with electric light. October 16th, 1879, was the memorable day when he arrived at the conclusion that a carbon filament might be made into a reliable lamp. With his usual absorption and pertinacity he set to work, and did not leave his laboratory for four days and four nights, until the matter was accomplished. Repeated experiments proved at first disastrous. Late on the second night, the longed-for result still eluding his grasp, Edison exclaimed to his associate, Mr. Charles Batchelor, "We will make a lamp before we sleep, or die in the attempt." It was on the morning of the second day from this that at length a perfect filament was secured. But in carrying it from the laboratory to another building, a breath of wind reduced it to powder. One does not wonder that Mr. Batchelor, at this misfortune after days and nights spent without sleep and little food, exclaimed to his chief, "Edison, it's gone—broken by the wind. I'm sick, I'm disgusted! My impression is, that job got too much reputation on a small capital." However, next morning another successful filament was secured, a lamp made and lighted. Then the two men went to their couches for a few hours. When they awoke, it was to find the electric lamp still burning—a truly magnificent success.


MRS. EDISON AND CHILDREN AT GLENMONT.

[*Drawn for* THE TEMPLE *by* A. TWIDLE.]

This was the beginning of what has become known as the Edison incandescent light, which is now illuminating our public buildings, and bids fair to become general for domestic purposes.

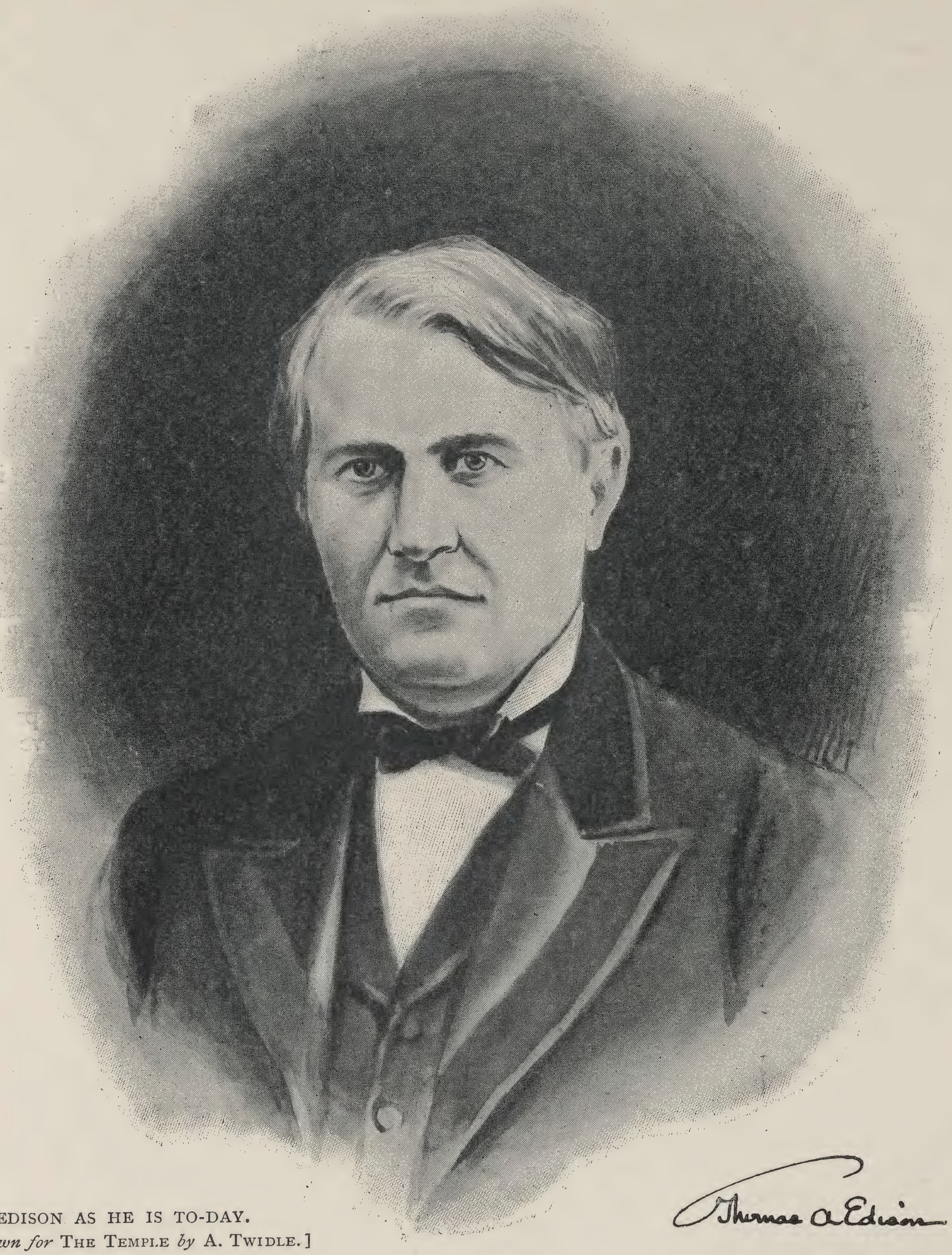
It was in 1880 that Mr. Edison gave a public exhibition of his new electric lamp at its birthplace in the Menlo Park Laboratory, and visitors flocked from every part of the United States to see the wonder. The invention had the usual effect of Mr. Edison's discoveries, and inflamed the popular mind until it was deemed possible for him to accomplish any marvel. One of the visitors to the Menlo Park Exhibition was a schoolmaster from a remote hamlet. A short time after his return home, this worthy man saw a brilliant light in the heavens over the top of the Ramapo Mountain, and promptly informed the rustics of the district, to whom he was an oracle of learning, that the mysterious light in the heavens had undoubtedly been placed there by Mr. Edison, and gaping crowds assembled each night to gaze at it. The fact that Mr. Edison was experimenting at Menlo Park, forty miles away, with an electric light and a balloon, gave plausibility to the idea that he had fixed up an incandescent light in the clouds.

The years which succeeded the introduction of his electric light were perhaps the most harassing of Mr. Edison's life. He had to face the detraction and obloquy so frequently the lot of a brilliant genius. Even originality was denied to him, and there was a hubbub of voices proclaiming that lighting by electricity was no new thing, while others declared that it was impracticable. While Mr. Edison was willing to admit that scientists had already demonstrated the principle of the electric light, he justly claimed that he was the first to perfect the system and make it of practical use.

Mr. Edison's domestic life also underwent a cloud at this period by the loss of his devoted wife, who had been for him in every way an ideal partner, able to understand the somewhat erratic nature of her husband, and sufficiently in sympathy with his work not to begrudge the consecration of so much of his time and thought to it. Mrs. Edison was a Miss Mary Stillwell, formerly engaged in her husband's works at Newark, and married in 1873, just at the time when Mr. Edison had made his mark and had an assured position. She continued to take a lively interest in all that went on at the laboratory, and was greatly beloved and respected by all the employees. The inventor's friends never tire of singing the praises of Mrs. Edison, so watchful was she that there should be no domestic jar to disturb the peace of mind so essential to her husband in the exercise of his inventive faculty. To her the world owes a debt of deep gratitude for her unselfish devotion to its great inventor and benefactor throughout the years when he was living at the greatest pressure, and but for her watchful care would probably have overtaxed his naturally robust constitution by neglect of food and sleep. She died in 1881, leaving a family of three children.

The last phase of Mr. Edison's scientific investigations is to be found in his experiments for the application of electricity to locomotion. How to obtain that force direct from the oxygen and carbon without the heating process which involves the steam-engine as a factor in making electricity, is the problem upon which Mr. Edison has been for some years at work. He confidently expects that the discovery will come by which electricity can be obtained by a simple chemical process which will render it sufficiently cheap for practical purposes and will make it the great power in the mechanical work of the world. Then, when the steam-engine with its cumbrous weight of fuel has been supplanted by a small and compact electrical motor, transit by rail and ocean will approximate to flying. There is no reason, Mr. Edison thinks, why in the future we may not be travelling by electricity at the rate of one hundred and fifty miles an hour.

An electric railroad close to his Menlo Park Works was the first practical step taken by Mr. Edison in the development of the new locomotion. This railway, as well as serving the purpose of scientific demonstration, was a fruitful field for playing off practical jokes—a diversion in which the great inventor takes as much delight as a schoolboy. On one occasion he had his little electric train filled with sedate directors and shareholders, bent on trying the effects of the new progression. Possibly, their irreproachable bearing and grave inquiries stirred the spirit of mischief in Mr. Edison, and when the company were seated in the open cars and engaged in weighty conversation, without the slightest intimation of his purpose he turned the motive power on at full force, and sent his living freight whizzing through the air at a speed which took away their breath and sent their hats in one direction and their coat-



EDISON AS HE IS TO-DAY.
[*Drawn for* THE TEMPLE *by* A. TWIDLE.]

Thomas A Edison

tails in another. The louder their protests the faster flew the cars, until Mr. Edison had had his joke out.

Electric railways, tram cars, and the new motor cars are all steps towards the realisation of Mr. Edison's dream that electricity will be the one great working power of the future; indeed, the possibilities which electrical science has before it seem too marvellous for conception. If by means of the telephone and phonograph we can hear and speak by electricity, it is not improbable that we may see and think by it also. Fantastic as the latter idea may sound, Mr. Edison and his assistant, Mr. Batchelor, have already experimented in the transference of thought by means of electric wires connected with their respective craniums. Often it has seemed that the problem was on the eve of solution, and any day a cablegram may announce to the civilised world that it is an accomplished fact.

In the realm of photography Mr. Edison

has accomplished marvels by means of electricity. His kinetophonograph combines photographic apparatus along with the ordinary phonograph, and by this dual arrangement impressions are given back to the eye as well as to the ear; and the inventor believes that in the future not only will the sound of the voices of great artistes be reproduced, but their forms and gestures will be given also, thus forming a perfect realistic picture of a musical or dramatic performance. Mr. Dickson, who has seen the kinetophonograph at work in Mr. Edison's laboratory, thus describes his impressions: "Nothing more vivid or more natural could be imagined than these breathing, audible forms, with their tricks of familiar gesture and speech. The inconceivable swiftness of the photographic successions, and the exquisite synchronism of the phonographic attachment, have removed the last trace of automatic action, and the illusion is complete. The organ-grinder's monkey jumps upon his shoulder to the accompaniment of a strain from 'Norma.' The rich tones of a tenor or soprano are heard, set in their appropriate dramatic action; the blacksmith is seen swinging his ponderous hammer, exactly as in life, and the clang of the anvil keeps pace with his symmetrical movements; along with the rhythmical measures of the dancer go her soft-sounding footfalls; the wrestlers and fencers ply their intricate game, guarding, parrying, attacking, thrusting, and throwing, while the quick flash of the eye, the tension of the mouth, the dilated nostrils, and the strong deep breathing give evidence of the potentialities within."

Mr. Edison's latest experiments have been in connection with the Röntgen Rays, and, in addition to being able to photograph the bones through the flesh, it is rumoured that the great wizard of electrical science has discovered a chemical so susceptible to the Röntgen Rays that it will be possible to construct an instrument that will show by means of the X Rays the internal organs and tissues of the body, as well as the bones, thus enormously increasing the powers of diagnosis possessed by surgeons in cases both of wounds and of the processes of disease. Should internal diagnosis be rendered thus easy, life will only be limited by accident and old age, and Mr. Edison will have crowned his work for science by adding to it this marvellous discovery for the preservation of life and the treatment of disease.

The spread of commercial enterprises connected with Mr. Edison's inventions has been prodigious during the last fifteen years. Giant factories for the manufacture of his patents have come one after another into existence, company after company has been formed, and the revenue derived from these sources is a large one. But not the inventor's greatest enemy would accuse him of being a money-grubber. If Edison has "struck electricity," never surely did any man touch a mine of wealth with less thought for material gain. His inventions have dropped from his brain with the peculiar spontaneity born of great genius; he could not help it, any more than the bird can account for its song. When once asked what impelled him to the incessant and tireless struggle of working at inventions, he was quite staggered by the question, and, after gazing in bewilderment at his interlocutor, said, "I like it. I don't know any other reason. You know some people like to collect stamps." One cannot but feel in studying the career of Edison that his genius amounts to inspiration, although he himself rather scouts the idea of "dreams in the night-time," and periods of special intuition, and very stoutly contends that what he has accomplished has been the result of hard thinking and practical application. He prides himself above everything in the fact that his inventions are of commercial utility, not mere wonder-working machines. What has made Edison the most wonderful man of the age is, we fancy, the union of genius, or inspiration, with infinite capacity for hard work. We are sometimes told that it is the latter which really constitutes genius, but alone it certainly lacks that peculiar quickness of vision which distinguishes the highest intellect. A man may be a model of persistent industry and yet accomplish no work of true genius. On the other hand, a genius without industry is a person only fit to be incarcerated in a "home for geniuses," such as one of Mr. Barrie's characters conceived for erection in *Thrums*. In Edison we have a man who not only possesses creative power, but who has worked for the greater part of his life from fifteen to twenty hours a day. The result is known to everyone.

A man of kindly heart and humane sympathy, Mr. Edison is a most generous and considerate employer; but there have been times in his works when to have mentioned an eight-hours day, or indeed any time limit, would have been the unpardonable sin. "Now, you fellows, I've locked the door, and you'll have to stay here until this job is completed," was the startling information to which he occasionally treated his employees. And stay they did, on one occasion for sixty hours at a stretch without sleep and with scarcely any food, until a hitch in some of the machinery had been discovered and rectified; but, needless to say, the master stayed too.

Prodigious as is Mr. Edison's faculty for work, he can play also—a trait in his character already alluded to, and of which further example is shown in the following story. After a successful trip to New York, at the beginning of his business career, where he had disposed of an invention very advantageously, he returned to his Newark factory, bubbling over with boyish hilarity, entered the workshop with a whoop, and astonished his employees by flinging his silk hat into an oil pan, and would have pitched his coat in after it, if he had not been prevented. Open-handed generosity is another of his characteristics, and many are the stories told of the lavish way in which he will scatter largesse amongst his men when there is some special piece of work to be accomplished. When he first began to manufacture the incandescent light, he discovered that a special kind of fibre made the best conductor for his lamps. Hearing of Mr. M'Gowan, a specialist in fibre-hunting, he sent for him, and briefly announced in characteristic fashion—

"I want a man to ransack the world for a fibre: how would you like to undertake it?"

Mr. M'Gowan replied that he was willing to go, and asked when he was to start.

"To-morrow," said Mr. Edison.

"That is a little early," said Mr. M'Gowan. "I have a few buttons to sew on before I can set off on a tour round the world."

Finally, the time for departure was extended, and when Mr. Edison took leave of his commissioner he placed in his hands a piece of fibre, saying briefly, "If you find as good as that I will be satisfied." After a year spent in a most hazardous and expensive expedition, Mr. M'Gowan reappeared at the Edison Laboratory. The chief happened to be passing through, and, seeing Mr. M'Gowan, extended his hand in the most matter-of-fact manner, asked, "Did you get it?" and hurried on to the work he was superintending. It transpired that in the interval the great electrician, instead of waiting for the arrival of the fibre which he had spent a little fortune to secure, had utilised an artificial carbon which he thought might supersede the bamboo. The incident is characteristic of Mr. Edison's absolute disregard of cost or trouble provided that he can procure just the thing he needs, and of his resourcefulness, and easy disregard of everything but the absorbing interest of the moment.

Of late years Mr. Edison has passed most of his time in the handsome and extensive laboratory which he built in 1886, at the foot of the Orange Mountains. The description of this unique building reads more like an account of a fairy palace than of an industrial centre. The library is of royal dimensions, and contains some forty thousand books of reference; flowers, statuary, portraits of celebrated men, models of dynamos and terrestrial globes are scattered about the magnificent apartment, while the entire furnishings are of the most costly and luxurious kind. As originally designed by Mr. Edison, his library was plain enough, but during one of his absences from home the laboratory staff and workmen converted it into a place of artistic beauty. Connected with the Orange Laboratory are a variety of workshops, a gigantic Store Room, an Exhibition Hall, where models of the inventor's creations are arranged, a Lecture Hall, photographic rooms, and the chemical room, which is Mr. Edison's favourite, and from which startling discoveries may emanate in the near future. From eight o'clock in the morning until six in the evening Mr. Edison is to be found in his laboratory in working undress, then he returns to his beautiful home of "Glenmont," where his second wife (a young and lovely woman) and a group of merry children await him. He enters little into society, partly owing to the infirmity of deafness from which he suffers, and partly to his absorption in his scientific studies,—and one wonders how a man of such world-wide renown has been able to keep himself so much apart from the great world. Now and again he has been caught in the lion-hunter's trap, as during the Paris Exhibition of 1889, when he was fêted at the Opera and mobbed by excited crowds in the streets, crying "Vive Edison!" Medals and decorations have been profusely awarded him by many societies in different parts of the world, including the Albert Gold Medal from the London Society of Arts, and the three degrees of the Legion of Honour from France, which are arranged and kept under Mrs. Edison's care in the drawing-room at Glenmont; there, too, are many autograph letters and presents from royal persons and notabilities. Possibly, the keynote to Mr. Edison's unparalleled success is to be found in his favourite motto: "I have my own ideas, and I take my stand upon them."

Edison May Rule Theatrical World

Modern Wizard Claims Latest Invention Will Democratize Drama

The trial theatrical syndicate is to be Wizard Edison if his "talkies" prove all that he has claimed for them. He has finally managed to couple up a phonograph to the films, so that the picture characters talk in unison with the motion. He declares that he can produce whole plays and operas.

"Actors will have to leave the legitimate stage to get any money," he declares, "and work in picture studios. We want democracy in our amusements. What chance has the ordinary working man to see a good pla
duced by good actors, or hear
opera in which stars appear, at
that he can pay? No chance
This will make it possible for
whose yearly taxes would not
three performances of the Met
tan Opera company to see and h
greatest stars in the world
cents."

When the Edison "talkies
coupled to the Edison "movies
sented in an Edison "poured"
in which the audience sits in
concrete chairs, to which they
Edison storage battery cars, wh
summoned after the theatre by
signals—well, what chance w
other producers have, anyhow?

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21 Feb — 1913

Thomas A. Edison was sixty-six years old the other day, but, in order to keep the real anniversary free for work, celebrated it on Sunday instead. As a worker he is a wonder, and there is no sign of cessation of his abnormal activity. The fact that Humboldt lived till he was over ninety and that scientific experimenters have been notoriously long-lived gives reason to believe that he will startle the world from time to time for many long years to come with his inventions. Like Humboldt, he is not in the habit of sleeping more than four or five hours, and the examples of the two men must lead one to question whether we could not, without suffering for it, greatly extend our working hours. On the other hand, President-elect Wilson comes out with the confession that he cannot get along with less than nine.

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r's fault
dinburgh

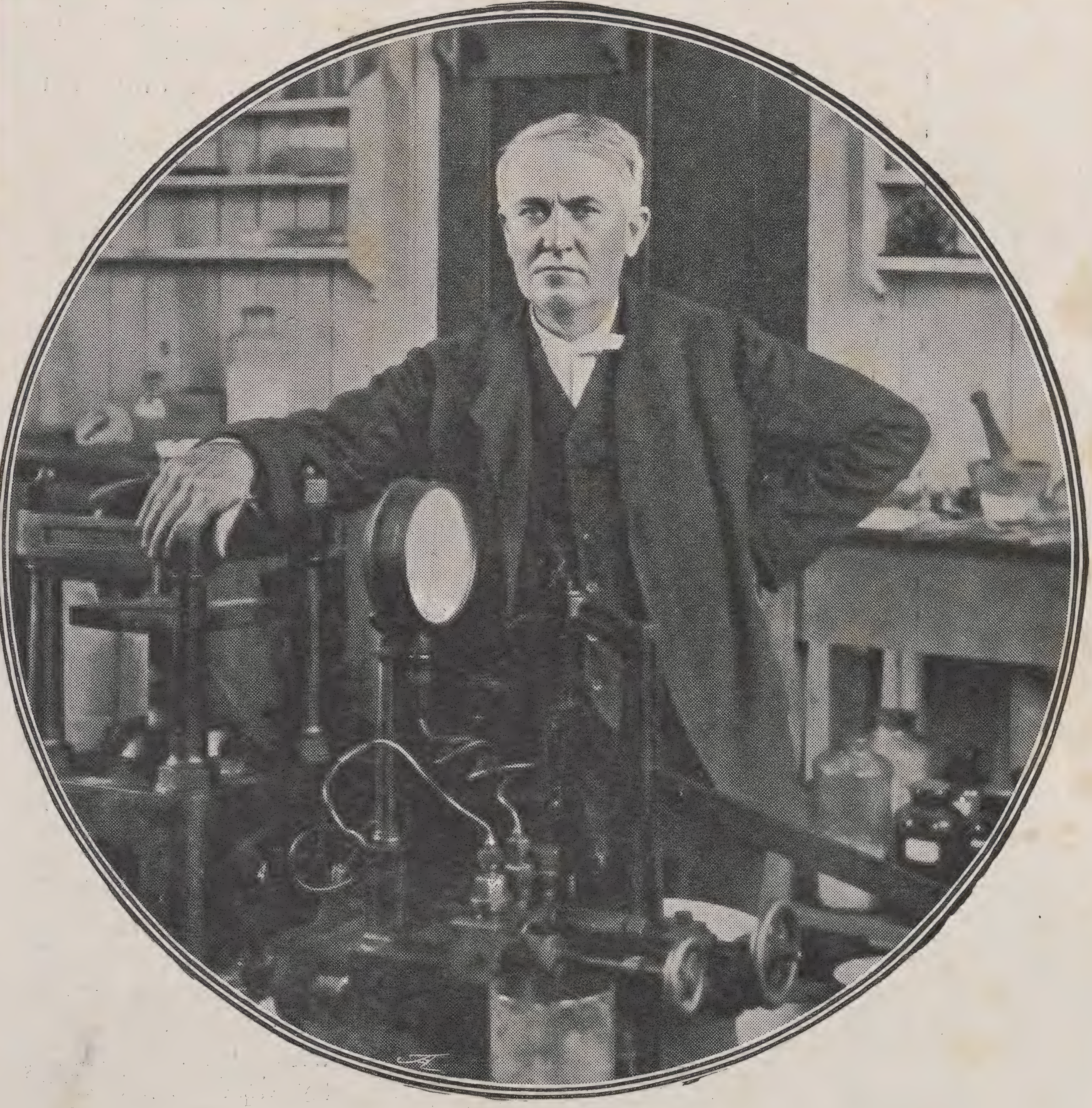
and misbehaving themselves until several
enraged ladies of the Close made a strong

withdrawn with a book to

The Elder's vault was jus
gular monument over a ce
burgh person in the adjac
The top stone or lid of t
abstracted by a rogue w
large slice of stone for
And it was in the box-li
Elder's bones that Tam
had ensconced himself w
one of the others had the
between them the boys
quickly designed a horrid

There was a loose door
rascals seized, and cunni
vault, and, having slid it
the daylight, half a dozen
jumped on to the door, and there sat singing

Tam very sorely indeed, for he had known



EDISON AT WORK
From a Stereoscopic photograph by Underwood and Underwood

and admired Elspeth since her little bare feet had first taken the air on the Close stones; and Geordie M'Culloch, the bridegroom, had been born the same year as himself, and so near him that with a pole he could reach Mr. M'Culloch's window from his mother's window.

It was to be a very exciting wedding festival, on the eve of the day. And Mr. M'Culloch's room was to be the scene of the festivities, with the two or three other available rooms on the same floor for the overflow of guests.

Elspeth herself wished Tam to be asked; but Geordie M'Culloch said no.

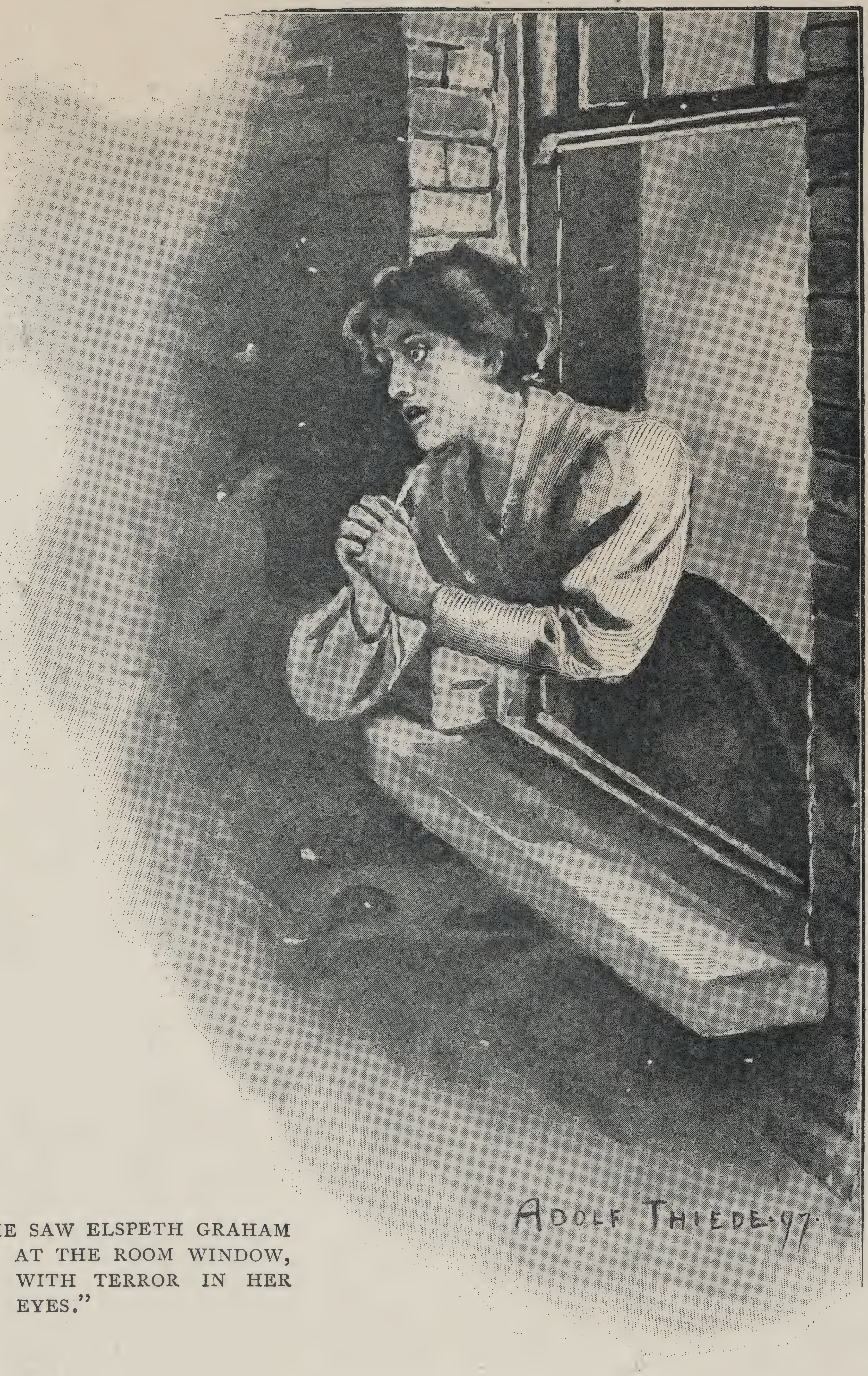
"A loony like him!" cried Geordie. "He begins to say a thing the day and doesna finish till the morrow. Gin you ask him, Elspeth, ye'll ha' to do without me, and that's na possible."

Upon this, Elspeth Graham gave way, and it was agreed that Tam should have a fine share of cold shoulder and nothing besides.

"Let them gang their own gait, the silly fules," said Mrs. Porter, for her son's comfort. Further, she resolved that she would so arrange things that on the supper night there should be a particularly thick array of washed clothes hung out between her window and Mr. M'Culloch's—to hide the sight of the merrymakers from her son's eyes. And the clothes should be of the worst and least ornamental kind—not one red or blue petticoat among them! She only wished, moreover, that she could so hang them that they should drip into Mr. M'Culloch's room, instead of upon the heads of the luckless strangers who chanced to take the short cut through David's Close to Cockburn Street.

And so the gay evening came, and the ugly clothes were thrust forth.

Tam returned home an hour later than usual this evening. He did not ordinarily care for the club to which he (and all his fellow-masons) belonged; but for once he endured an hour of its dulness, almost falling



"HE SAW ELSPETH GRAHAM AT THE ROOM WINDOW, WITH TERROR IN HER EYES."

asleep over a newspaper. Then home he went, climbed the terrible winding staircase of the building, and sat down to his tea.

Mrs. Porter straightway talked for three. The good soul meant to distract Tam from thoughts about the wedding party over the way. But she showed precious little tact in the matter, every now and again referring to this or that new arrival in M'Culloch's room, the sound of whose voice came to her through the open windows.

"And never a one of them to equal my bonnie boy Tam!" quoth she.

At which Tam smiled rather drearily.

"You're o-o-ower fond of me, I'm thinking, m-m-m-mother," he said, with a desperate and successful effort at intelligibility.

"I ken ye, at anyrate, which is more than ony ither soul can say," was Mrs. Porter's reply, which set Tam reflecting, but did not exactly fill him with delight.

He tried to persuade his mother to remove the drying clothes, but without success.

Also, he begged her not to make her comments quite so loudly on the different characters of the persons who had been favoured with invitations to Mr. M'Culloch's room and feast.

Mrs. Porter was a downright good specimen of a David's Close woman—full of fight, self-opinionated, and eager to express her opinions.

At last, to choke off his various thoughts on matters domestic and neighbourly, Tam seized the book on mathematics which he had lately (to his mother's unbounded admiration) begun to study, and put his two hands to his two ears the better to concentrate his attention upon it.

Thus the laughter and talk from over the way reached him faintly as the distant falling of water; and even his mother's remarks did not call for reply.

So matters proceeded until past nine o'clock. By then Tam was thoroughly engrossed in the properties of triangles, and seeing all sorts of dim connections between the uses of mathematics and the practice of bricklaying. By then, too, Mrs. Porter had taken herself away to a neighbour as talkative as herself, whom she stunned with the torrent of calumnies on the Grahams and M'Cullochs poured forth by her ready tongue. By then, too, the wedding party over the way had got to the whisky.

It was not a cheerful night. A drizzle of rain had begun—happily for the clothes, before Mrs. Porter had left the room. These were now all inside, so that there was an unobstructed view of the revellers round the lamp in Mr. M'Culloch's apartment. Elspeth could see Tam over his book, and he could see *them* all whenever he chose.

The blackness of the abyss between the two blocks of the Close buildings was emphasised by the yellow lamplight on both sides.

This same blackness was intensified by something else for a good many minutes before the added cause was discovered. Smoke was the cause.

Tam himself was the first of the David's Close inmates to suspect that aught was wrong. His window was not shut very tight, so that the smoke and smell of burning at length were unmistakable to him.

He opened the door to see if the nuisance (or worse) belonged to his block. But it did not seem to.

Then it occurred to him to open his window, braving the eyes of the revellers across the way, some of whom were far gone in their cups.

The instant he did this, a tongue of flame—the first—shot from the window two storeys below Mr. M'Culloch's room.

"S-s-save us!" cried Tam. "They'll all be b-b-burned where they s-s-stand."

He shouted and gesticulated, but for several seconds could not gain the attention of Mr. M'Culloch's guests. Elspeth was not then in the room; otherwise, perhaps, he would have succeeded earlier.

Mr. M'Culloch's window was now thrown open.

"Run down, for your lives, men!" cried Tam in a breath. "D-d-dinna ye see the house is on fire?"

Lamentable was the confusion that ensued. Tam heard cursing and exclamations from Mr. M'Culloch's room, mingled with the noise of feet stampeding down the hard stone steps.

Then the first shriek sounded.

"God s-s-send them safely out on't!" murmured Tam.

He bent over the sill to see if anything was being done below; but he could not stand much of the pungent smoke of David's Close in conflagration. To relieve his mind, he shouted from his own landing outside to all and sundry in his block, telling those below what had happened. The wonder was, perhaps, that some of them had not found it out for themselves.

However, as none of the crowd returned to Mr. M'Culloch's room, it seemed clear they had made a successful rush for safety.

Tam took this view of affairs, and was himself about to descend to the street level, when a cry reached his ears, and, looking across, he saw Elspeth Graham—none other—at the room window, with terror in her eyes.

"Help! help!" the poor girl cried.

"Run down, lass, f-for your l-life!" shouted Tam to her.

"But I canna, for the smoke," she answered, with a sob. "It's too late."

"Run again, and t-t-try. You must. Try!" urged Tam desperately.

"Hoots, man!" said Tam.

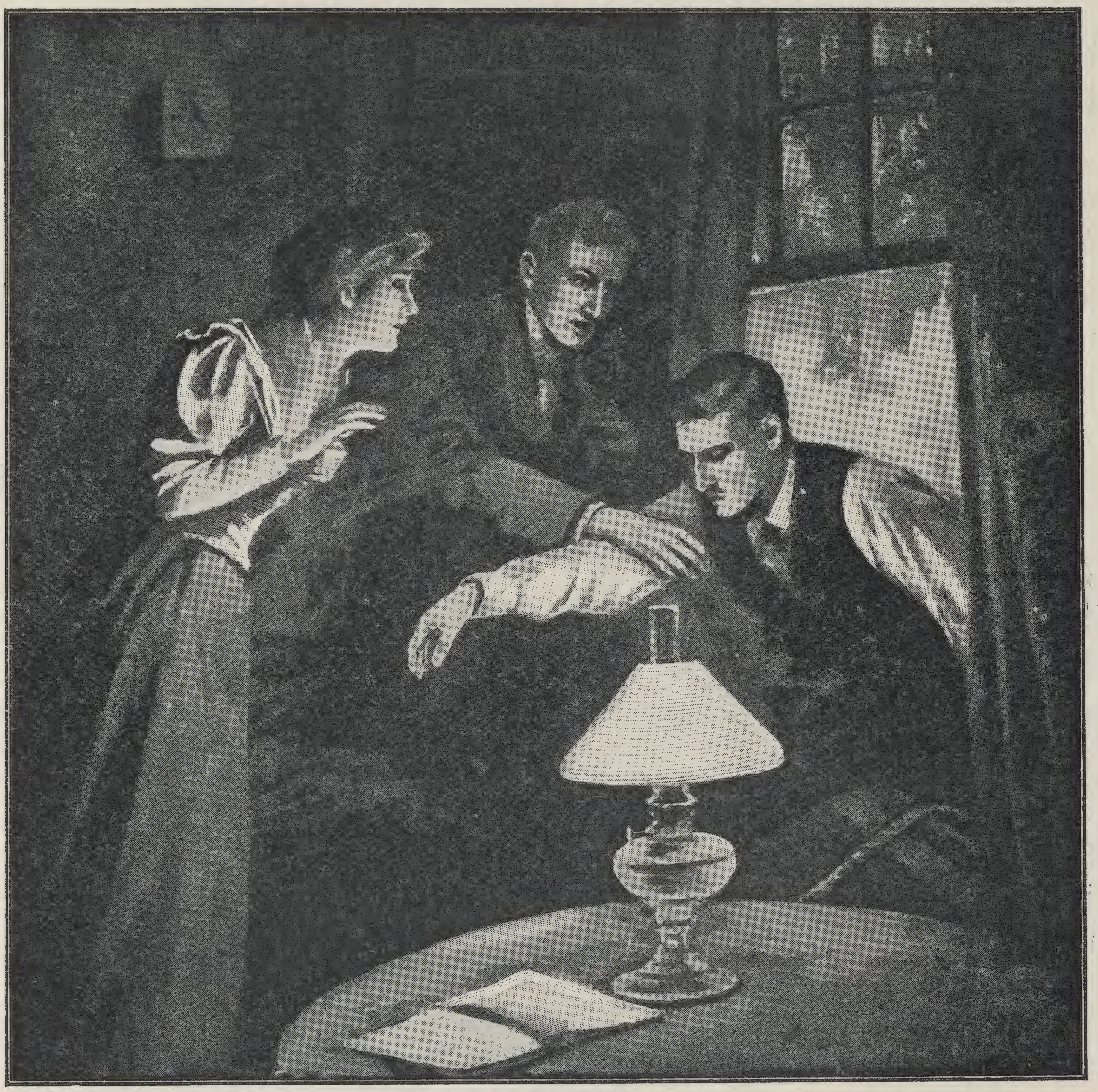
Ere the words were out of his mouth, Elspeth's white face reappeared in M'Culloch's room.

"I canna do it!" she wailed.

In silence Tam looked about his mother's room—hopelessly. The clothes-sticks were not nearly long enough. And there was the ghastly hundred feet of space below, even if the sticks could be got from one window to another.

Mr. Bullen wrung his hands.

"There's naething possible to be done, lassie!" he cried. "Wait for the firemen folk—perhaps they'll reach ye."



"THEN HE TOO SCRAMBLED OVER THE WINDOW LEDGE."

Elspeth stood hesitating for a moment, then burst into tears, and disappeared, leaving Tam terribly concerned.

"What will we do if the fire's too hot to face?" he groaned.

A Mr. Bullen, from the floor below, here joined Tam and heard his tale.

"She'll be suffocated, the puir lass!" said Mr. Bullen. "Geordie M'Culloch will never wed her."

Of all hopeless suggestions! Elspeth herself in these words realised the doom that was upon her.

Then, in an instant, it flashed to Tam.

"Keep t-t-talking to her, Mr. Bullen," he whispered, and rushed away—to return in a couple of minutes with a coil of thick scaffolding rope.

The heat and smoke from below were now so great that Elspeth could hardly be seen for the one, or faced for the other.

But Tam bent from his sill and explained the situation.

"You must f-f-fasten it to the grate in the f-fireplace. There's nothing s-s-stronger. And be sure to make a d-d-double knot. Then, please God, we'll save you. Catch it —quick!"

So saying, he threw the end of the rope to her.

Elspeth caught it, but did not move.

"I darena cross!" she sobbed.

"Fasten it, lass, and leave the rest to me," urged Tam.

This she proceeded to do, while Tam and Mr. Bullen secured their end. Eventually the rope seemed quite taut.

Mr. Bullen was almost out of his mind with excitement.

"Ye'll be killed, man!" he protested.

But Tam only threw off his coat for reply.

"I'm coming, Elspeth," he said. "If it'll bear one, it'll bear half a dozen."

The distance was only fifteen feet; but it was enough. Tam went hand over hand, holding his breath—as did the other two; and finally dragged himself into Mr. M'Culloch's room.

"You s-s-see how easy it is!" he said, with a strained smile. "Can you trust yourself on my back?"

Elspeth looked at him, coughed from the smoke and said, "Yes, Tam, if ye wish it."

"Ay, *and* Geordie would wish it," said Tam. "Now then, I've got my wind. Be s-sure you grip me f-fast, and shut your eyes. Then it'll be just nothing to you."

The start was awkward. Elspeth made a slip in getting on to Tam when he was already hanging, and then inadvertently all but choked him. The flames from below almost licked their heels.

Midway, Tam thought he could not do it. Elspeth weighed upon him like a mountain of lead. But he moved on inch by inch all the same, resolved about one thing only—that nothing should make him let go of the rope. Mr. Bullen's voice encouraged him, tremulous though it was.

But it was like heaven itself, he thought, to come alongside his own sill and to hear Mr. Bullen exclaim—

"Now, lassie, just let me lift you off him and inside."

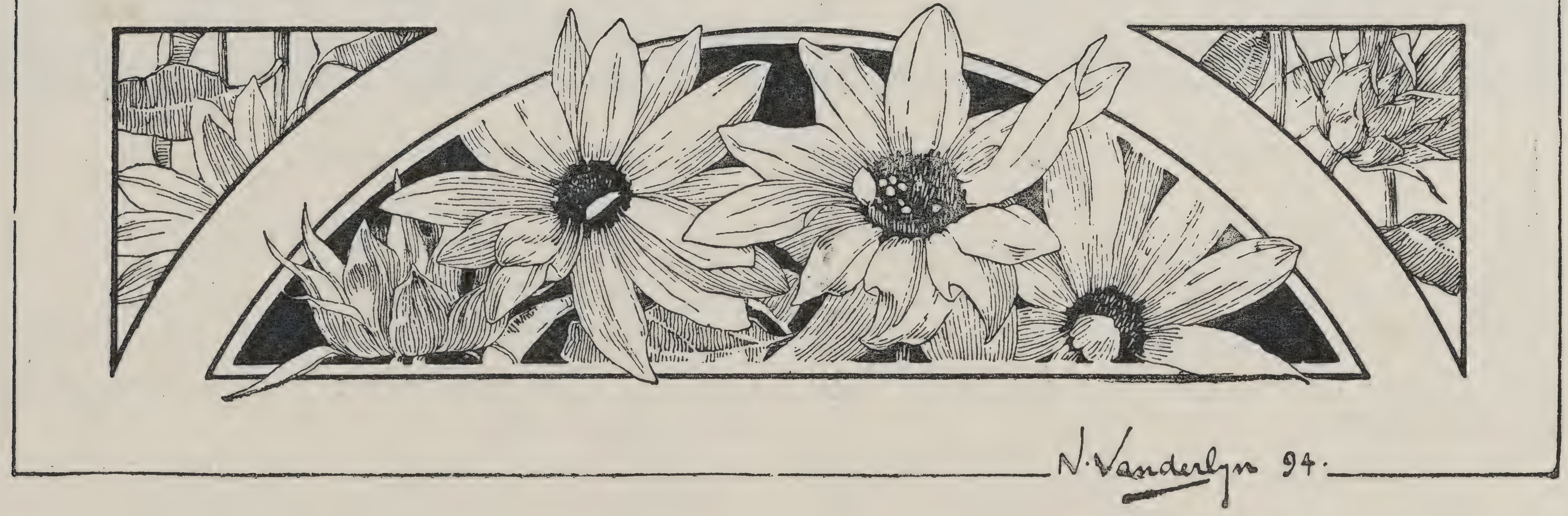
With the removal of Elspeth a sudden faintness came upon Tam. However, it was only momentary, and then he too scrambled over the window ledge, and all was well.

David's Close will never forget the scene that ensued upon the appearance of Elspeth M'Culloch from out the staircase of the other block of buildings, with Mr. Bullen and Tam Porter at her heels.

Geordie was half demented for joy.

Meanwhile, Mr. Bullen explained matters. Tam was for sneaking off half-way, but they stopped him; and that night was the beginning of a new era in Tam Porter's life. The number of hands he had to shake!

By the time the fire was out, all David's Close agreed that Tam was a hero, and a credit to the town and his mother.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